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(54) [TITLE OF THE INVENTION] Traffic Load Distribution Method for a Mobile Communication System

(57) [ABSTRACT]

[Task] To provide a traffic load distribution method for a mobile communication system capable of distributing traffic that is concentrated in a particular base station to other base stations.

[Means] Base stations 20 and 21 are provided with means 25 for detecting a state of traffic concentration that exceeds the stipulated number of channels that are capable of performing communication due to terminal devices 37 to 41 becoming concentrated in a communication area 28 created by a host base station 21 and control means 26 for giving instructions to lower control channel signal levels of the host base station 21 when the above detection is made and to raise the signal levels to the peripheral base station 20 or alternatively to raise signal levels in accordance with an instruction from the peripheral base station 20. The system is structured such that signal levels of the base station 21, which is in a state of traffic concentration, are lowered so that the communication area is contracted as is shown by 34; levels of the peripheral base station 20 are raised so that the communication area is enlarged as is shown by 33; and the terminal devices 37 and 38 which had hitherto received control channel signals of the base station

21 are placed in the communication area 33 so as to receive the signals of the base station 20.

[CLAIM(S)]

[Claim 1] A traffic load distribution method for a mobile communication system that distributes traffic concentrated in one base station to another base station, wherein

a host base station is provided with:

traffic concentration detection means for detecting a state of traffic concentration in which a stipulated number of channels that are able to perform communication is exceeded due to terminals becoming concentrated in a communication area created by the host base station; and

transmission output control means for lowering control channel signal levels of the host base station when a state of traffic concentration is detected and issuing instructions to raise control channel signals in peripheral base stations, as well as performing control to raise the control channel level signals in accordance with such an instruction from a peripheral base station, and wherein

the raising and lowering of the control channel signal levels is performed such that terminals that are adjacent to a communication area of a peripheral base station while located within the communication area of the host base station are placed in the communication area of the peripheral base station.

[Claim 2] The traffic load distribution method for a mobile communication system according to claim 1, wherein, instead of

the transmission output control means, there is provided a regulating signal transmission means that, when the state of traffic concentration is detected, transmits to a waiting terminal a regulating signal informing that a particular base station cannot be used.

[Claim 3] The traffic load distribution method for a mobile communication system according to claim 1, wherein, instead of the transmission output control means, there is provided control channel activating and deactivating means that, when the state of traffic concentration is detected, stops control channel signals during transmission.

[Claim 4] The traffic load distribution method for a mobile communication system according to any of claims 1 to 3, wherein the traffic concentration detection means is provided with: a table for storing individual terminal numbers; storage control means for storing in the table individual numbers of terminals for which a call loss has been generated such that none are duplicated; and determining means for determining that a state of traffic concentration exists when the number of individual numbers stored in the table exceeds a set threshold value within a set time.

[Claim 5] The traffic load distribution method for a mobile communication system according to any of claims 1 to 3, wherein concentration instruction means for issuing an instruction to the relevant base station to collect the individual numbers is provided in an exchange to which the base station is connected, and wherein the traffic concentration detection means is

provided with: notification request control means for attaching to notification information in accordance with the collection instruction an individual number notification request and transmitting this to a terminal; and determination means for counting individual numbers that are reported in accordance with the notification request and determining that a state of traffic concentration exists when the count number exceeds a set threshold value within a set time.

[Claim 6] The traffic load distribution method for a mobile communication system according to any of claims 1 to 3, wherein registration instruction means for issuing an instruction to register an optional area within a comprehensive call area as a false area is provided in an exchange to which the base station is connected, and wherein the traffic concentration detection means is provided with: alteration means for altering a comprehensive call area number to a false comprehensive call area number that is different from the comprehensive call area number in accordance with the registration instruction; and determination means for counting the number of position registration requests from terminals that have received the false comprehensive call area numbers and determining that a state of traffic concentration exists when the count number exceeds a set threshold value within a set time.

[Claim 7] The traffic load distribution method for a mobile communication system according to claim 6, wherein the alteration means alters the comprehensive call area number to a false comprehensive call area number by altering the bit length

of the comprehensive call area number.

[Claim 8] A traffic load distribution method for a mobile communication system in which a high output base station that creates a large communication area is connected to an exchange, wherein

the exchange is provided with group control means that forms a plurality of base stations whose areas overlap each other into one group, and issues an instruction to set at maximum a control channel level of one base station within each group to base stations that have available communication channels with the instruction requiring that areas of base stations whose control channel levels have been set at maximum in adjacent groups are not adjacent to each other,

and the base stations are provided with:

over channel limits notification means for notifying the group control means that a stipulated number of communication channels in one area are all in use; and

transmission output control means that, when the communication channels are all in use, lowers control channel signal levels and sets at maximum control channel signal levels in accordance with an instruction from the group control means to set the control channel signal levels at maximum.

[Claim 9] The traffic load distribution method for a mobile communication system according to claim 8, wherein, instead of the transmission output control means, there is provided regulating signal transmission means that, when all of the communication channels are in use, transmits to a waiting

terminal a regulating signal informing that a particular base station cannot be used.

[Claim 10] The traffic load distribution method for a mobile communication system according to claim 8, wherein, instead of the transmission output control means, there is provided control channel activating and deactivating means that, when all of the communication channels are in use, stops control channel signals during transmission.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[Technical Field]

The present invention relates to a traffic load distribution method for a mobile communication system. This traffic load distribution method for a mobile communication system is particularly applicable to a personal handyphone system (PHS). In PHS, the number of communication channels of a single base station is regulated by a legal standard to be three. Therefore, cases occur when communication is not possible in areas where a large number of people are concentrated. Therefore, a method is required that can cover communication in areas such as this.

[0002]

[Related Art]

A description will now be given of the structure of a PHS system shown in Fig. 16. In Fig. 16, the symbol 1 indicates a PHS exchange that is connected to a public telephone network 2. The symbols 3, 4, and 5 are a plurality of base stations

(CS) that are connected by cable to the PHS exchange 1. Each base station uses transmitted radio waves to create the respective communication areas 6, 7, and 8 that have an area of approximately 100 to 200 m.

[0003]

An unillustrated mobile telephone (referred to below as a terminal) performs communication with another terminal when it is located in one of the communication areas 6, 7, or 8 by selecting the highest level control channel signal that is transmitted from the respective base stations 3, 4, and 5 and performing signal transmission and reception via the selected base station (i.e. one of 3, 4, or 5).

[0004]

[Problem to be Solved by the Invention]

It should be noted that in the above described PHS, only three communication channels are allowed for each base station leading to the problem of cases occurring in which traffic becomes concentrated and communication becomes impossible in areas where a large number of people are gathered.

[0005]

For example, in Fig. 17, in which the terminals 10 to 18 have been inserted in the respective areas 6 to 8 of Fig. 16, if the three terminals 12, 13, and 14 located in area 7 perform signal transmission and reception via the second base station 4, the other two base stations 15 and 16 located in the same area 7 are unable to perform signal transmission and reception.

[0006]

In order for the other terminals 15 and 16 to perform signal transmission and reception via the other base stations 3 and 5, they need to move in the direction of the areas 6 and 8 and move to a point where the levels of the control channel signals from the base stations 3 and 5 are higher than the level of the control channel signal from the base station 4 and then select a control channel signal from base station 3 or base station 5.

[0007]

Normally, because the people holding the terminals 10 to 18 are walking around, they do not become concentrated in a particular area so the traffic is distributed and the above described problem does not occur. However, at a racetrack or theater terminals become concentrated that are not accompanied by a movement to a particular area resulting in traffic becoming concentrated in a particular base station and creating the above described problem.

[0008]

The present invention was conceived in view of the above point and it is an aim thereof to provide a traffic load distribution method for a mobile communication system that is capable of distributing traffic that is concentrated in a particular base station to other base stations.

[0009]

[Means for Solving the Problem]

Fig. 1 is a view of the principle behind the present invention. The traffic load distribution system for a mobile

communication system that is shown in Fig. 1 distributes traffic that is concentrated in one base station to other base stations. The present invention is characterized in that base stations 20 and 21 are provided with traffic concentration detecting means 25 for detecting a state of traffic concentration that exceeds the stipulated number of channels that are capable of performing communication due to terminal devices 37, 38, 39, 40, and 41 becoming concentrated in a communication area 28 created by the host base station 21 and transmission output control means 26 for giving instructions to lower control channel signal levels of the host base station 21 when a state of traffic concentration is detected and to raise the control channel signal levels to the peripheral base station 20, or alternatively, for performing control to raise control channel signal levels in accordance with a previous instruction from the peripheral base station 20. The system is structured such that the levels of the control channel signals are lowered or raised so that the terminals 37 and 38 that are inside that part of the communication area 28 of the host base station 21 that is close to the communication area 27 of the peripheral base station 20 are inside the communication area 33 of the peripheral base station 20.

[0010]

Namely, by lowering the level of the control channel signals of the base station 21 that is in a state of traffic concentration, the communication area is contracted as indicated by the oval 34 shown by the broken line; and by raising the level of the

control channel signals of the peripheral base station 20 that is in a state of traffic concentration, the communication area is expanded as indicated by the oval 33 shown by the broken line, resulting in the terminals 37 and 38 that had hitherto received the control channel signals of the base station 21 entering in the communication area 33 and receiving the control channel signals of the base station 20.

[0011]

[Embodiment(s) of the Invention]

A description will now be given of the embodiments of the present invention with reference made to the drawings. Fig. 2 is a view for describing the traffic load distribution method in the PHS according to the first embodiment of the present invention. Note that the public telephone network shown in Fig. 16 has been omitted from Fig. 2.

[0012]

In Fig. 2, the symbols 20, 21, 22, and 23 indicate a plurality of base stations. As is shown in Fig. 3, each base station is provided with the transmission output control section 26 and the traffic concentration detecting section 25 that are feature elements of the present invention.

[0013]

The traffic concentration detection section 25 detects when a predetermined quantity of traffic that exceeds the stipulated number of channels capable of being used for communication (i.e. three channels) is concentrated in a particular base station due to the concentration of terminals in a single communication

area created by the base station.

[0014]

The transmission output control section 26 controls the strength of the level of control channel signals and issues instructions (a transmission output increase instruction) for the control channel signal level of a base station detected to be in a state of traffic concentration to be lowered and the control channel signal levels of base stations peripheral thereto to be raised. In addition, it performs control to raise the control channel signal levels in accordance with a transmission output increase signal from another base station.

[0015]

For example, as is shown by the symbols 27, 28, 29, and 30 in Fig. 2, when the respective base stations 20 to 24 create areas using control channel signals having the same level, then, for example, the terminals indicated by the symbols 36, 37, 38, 39, 40, 41, and 42 might be concentrated in a predetermined area, as illustrated, with the terminals 37 to 41 being concentrated in area 28 created by the base station 21.

[0016]

In this case, as a result of the traffic concentration detection section 25 of the base station 21 detecting a state of traffic concentration, the transmission output control section 26 of the host base station 21 lowers the level of the control channel signals and, as is shown by the arrows 31 and 32, issues an instruction to the peripheral base stations 20 and 22 for the level of their control channel signals to be

raised.

[0017]

In accordance with this instruction, the transmission output control sections 26 of the peripheral base stations 20 and 22 raise the level of the control channel signals. As a result of the above control, the area 28 of the base station 21 is reduced to the area shown by the symbol 34; and the areas 27 and 29 of the base stations 20 and 22 are enlarged to the areas shown by the symbols 33 and 35.

[0018]

Moreover, out of the terminals 37 to 41 that were located in the area 28 before the level control was performed, if the terminals 37, 40, and 41 that were below the signal level at which they can maintain a state of call readiness are placed in the areas 33 and 35 that were enlarged by the raising of the levels, they may select the control channel signals of the base stations 20 and 22 created by the areas 33 and 35.

[0019]

As a result, the traffic that had been concentrated in the base station 21 is able to be distributed to the peripheral base stations 20 and 22 and the terminals 37, 40, and 41q that had not been able to perform communication are placed in a state where they can perform communication.

[0020]

Next, the methods of the first to third aspects of the present invention in which the traffic concentration detection section 25 detects the above described traffic concentration

states will be described. In the first method, when a call loss in which a call is cut off at a base station is generated by the blocking of a control channel signal, the base station that performed the call loss stores the terminal number (referred to below as the ID), which is a number peculiar to that particular terminal. Thereafter, if a call loss is generated, the base station ignores the same ID and counts up the number of stored IDs while storing different IDs that have generated new call losses. If the count number exceeds a predetermined threshold value within a predetermined time, it is determined that a state of traffic concentration exists.

[0021]

Namely, as is shown in Fig. 4, the traffic concentration detection section 25 is provided with an ID storage control section 45, a call loss number table 46 for storing IDs via the control of the ID storage control section 45, and a determination section 47 for counting up the number of IDs stored in the call loss table 46 and determining that a state of traffic congestion exists when the count number exceeds a predetermined threshold value, for example, "4" within a predetermined time.

[0022]

In this type of structure, as is shown by the symbol 48 in Fig. 5, if a terminal having the ID "11111111" makes a link channel probability request to a base station in which three subscribers are already communicating, a call loss is generated. Therefore, as is shown by the symbol 50, the ID storage control section 45 registers the ID "11111111" in the call loss number

table 46. At this time, as is shown by the symbol 51, a denial of a link channel allocation is made for the terminal having the ID "11111111".

[0023]

It is now assumed that different IDs "22222222", "33333333", and "44444444" have also been registered in the same way as this. Here, the ID storage control section 45 makes no alteration to the call loss number table 46 no matter how many times a transmission is made from a terminal having an ID already registered in the call loss number table 46.

[0024]

Next, as is shown by the symbol 52, when a terminal having the ID "55555555" makes a link channel probability request, as is shown by the symbol 53, the ID "55555555" is registered in the call loss number table 46; and as is shown by the symbol 54, it is assumed that a denial of a link channel allocation is made for the terminal having the ID "11111111".

[0025]

In this case, because the ID count number in the determination section 47 exceeds the set threshold value of "4" to reach "5", it is determined that a state of traffic concentration exists and the state of traffic concentration is detected.

[0026]

The second method will now be described. As is shown in Fig. 6, the maintenance center 57 of the PHS exchange to which the base station 21 is connected is provided with an ID

collection instruction section 58 for issuing an instruction to the base station 21 for the base station 21 to collect terminal IDs (i.e. an ID collection instruction).

[0027]

The base stations are also provided with an ID notification request control section 59 for attaching ID notification requests to notification information and transmitting this to terminals in a call-ready state in accordance with the ID collection instruction; and with a determination section 60 for counting the number of IDs about which it receives notification in accordance with the ID notification request, and determining that a state of traffic congestion exists when the count number exceeds a predetermined threshold value within a predetermined time.

[0028]

In this type of structure, as is shown by the symbol 61 in Fig. 7, the ID collection instruction section 58 of the maintenance center 57 sends the ID collection instruction shown by the symbol 62 to the base station 21 that creates the area for which traffic concentration is predicted.

[0029]

As a result, as is shown by the symbol 63, the ID notification request control section 59 of the base station 21 attaches an ID information request to notification information and transmits it to the plurality of terminals in call waiting states that are located within the areas of the base station 21.

[0030]

In accordance with this request, the IDs that are sent from the respective terminals and are shown by the symbol 63 are counted by the determination section 64. If this count number exceeds a set threshold value within a predetermined time, as is shown by the symbol 65, then, as is shown by the symbol 66, a state of traffic concentration is detected by determining that a state of traffic concentration exists.

[0031]

The third method will now be described. This method employs position registration areas (comprehensive call areas). Comprehensive call areas are the large areas 78 and 85 comprising the area groups 73 to 77 and 82 to 84 of the plurality of base stations 68 to 72 and 79 to 81 shown in Fig. 8. The comprehensive call areas are provided in order to decide which region the PHS exchange 1 should call when it receives an incoming signal from an unillustrated public telephone network.

[0032]

Normally, the terminal 87 stores comprehensive call area numbers from the contents of the notification information when its power is turned on and sends position registration requests to the base station 70. As a result, the comprehensive call area 78 for calling the terminal 87 from the PHS exchange 1 is set.

[0033]

At this time, a position registration request is not performed no matter where the terminal 87 moves to inside the comprehensive call area 78. The next time the position

registration is performed is when the terminal 87 leaves the comprehensive call area 78 and enters the different comprehensive call area 85, namely, at a time when the comprehensive call area number of the notification information changes from the one stored in the terminal 87.

[0034]

The comprehensive call area numbers of the notification information sent from the base stations 68 to 72 in the same position registration area 78 are all the same. Therefore, the terminal 87 does not make a position registration request.

[0035]

Therefore, as is shown in Fig. 9, in the third method, inside the comprehensive call area 105 created by the area group 97 to 104 of the terminals 89 to 96, the areas 100 and 101 where there is a likelihood of terminals being concentrated are given the false appearance of being a different comprehensive call area (referred to below as a false area and indicated by the symbol 106). When a terminal moves to the false area 106, a position registration request is sent and if the number of sent position registration requests exceeds a set threshold value within a predetermined time, then it is determined that a state of traffic concentration exists.

[0036]

As is shown in Fig. 10, in order to realize this method, a structure is employed in which a false area registration instruction section 108 is provided in the PHS exchange 1, and a comprehensive call area number alteration section 109 and a

determination section 110 are provided the traffic concentration detection section 25 of the base stations 92 and 93.

[0037]

As is shown in Fig. 9, the false area registration instruction section 108 issues false area registration instructions to the base stations 92 and 93 that create the areas 100 and 101 that are to be made into the false area 106.

[0038]

The comprehensive call area number alteration section 109 alters comprehensive call area numbers in accordance with false area registration instructions. This alteration processing will now be described while referring to Fig. 11. The comprehensive call area number alteration processing alters the length of comprehensive call area numbers contained in the notification information from the relevant base station.

[0039]

As is shown in Fig. 11 (a), the structure of the transmission notification information has 9 bits of operator identification symbols shown by 112, n bits of comprehensive call area numbers shown by 112, 33-n bits of additional IDs shown by 114, and notification information shown by 115. The n bits of the comprehensive call area number length are shown in the notification information 115.

[0040]

For example, as is shown in Fig. 11 (b), the comprehensive call are number length in the notification information is shown

as = 16 bits, namely, the comprehensive call area number is "0000000000101010: binary" = "42: decimal". Normally, this comprehensive call area number would be known as "42".

[0041]

However, in a specific base station whose area is to be made into a false area, for example, as is shown in Fig. 11 (c), the comprehensive call area number length in the notification information is altered to 12 bits by the comprehensive call area number alteration section 109. As a result, the comprehensive call area number becomes "000000000010: binary" = "2: decimal".

[0042]

The determination section 110 determines that a state of traffic concentration exists when the number of position registration requests that are transmitted when terminals enter the false area 106 exceeds a set threshold value within a predetermined time.

[0043]

In this type of structure, as is shown by the symbol 61 in Fig. 12, the false area registration instruction section 108 of the PHS exchange 1 sends a false area registration instruction shown by the symbol 118 to the base stations 92 and 93 that create the area for which traffic concentration is predicted.

[0044]

In accordance with this instruction, the comprehensive call area number alteration sections 109 of the base stations 92 and 93 alter the comprehensive call area numbers. These altered comprehensive call area numbers are attached to notification

information and sent to a terminal, however, at this time, it will be assumed that the notification information of the base station 92 indicated by the symbol 119 is received by the plurality of terminals within the false area.

[0045]

In this case, as is shown by the symbol 120, each terminal detects the alteration of the position registration area (i.e. the comprehensive call area) and, as is shown by the symbol 121, stores the new comprehensive call area number "2" by making a position registration request to the base station 92.

[0046]

Moreover, the determination section 110 of the base station 92 counts the number of position registration requests and detects that a state of traffic concentration exists by determining that a state of traffic concentration exists when the count number exceeds a set threshold value within a predetermined time.

[0047]

Next, a description will be given of the second embodiment while referring to Fig. 13. Note that the same symbols are given to portions of the second embodiment shown in Fig. 13 that correspond to portions of the first embodiment shown in Figs. 2 and 3 and a description thereof is omitted.

[0048]

The feature of the second embodiment shown in Fig. 13 is that a regulating signal transmission section 123 is provided in the base stations 20 to 23. The regulating signal

transmission section 123 transmits to a waiting terminal a regulating signal providing information that the relevant base station cannot currently be used when a state of traffic concentration is detected by the traffic concentration detection section 25.

[0049]

For example, if a state of traffic concentration is detected in the base station 21 shown in Fig. 2, the regulating signal transmission section 123 transmits regulating signals to the waiting terminals 28, 40, and 41 informing them that the relevant base station 21 currently cannot be used.

[0050]

The terminals 28, 40, and 41 that receive the regulating signals switch to the control channels of the peripheral base stations 20 and 22. As a result, the traffic that had been concentrated in the base station 21 can be distributed to the peripheral base stations 20 and 22

[0051]

Next, a description will be given of the third embodiment while referring to Fig. 14. Note that the same symbols are given to portions of the third embodiment shown in Fig. 14 that correspond to portions of the second embodiment shown in Fig. 13 and a description thereof is omitted.

[0052]

The feature of the third embodiment shown in Fig. 14 is that a control channel on/off section 125 is provided in the base stations 20 to 23. The control channel on/off section 125 turns

off the transmission of control channel signals that are transmitted from the relevant base station when a state of traffic concentration is detected by the traffic concentration detection section 25. In addition, it turns the transmission on again when no state of traffic concentration is detected.

[0053]

By forcibly stopping the transmission of control channel signals in this way, encouragement is given to waiting terminals to switch to control channels of another base station so as to achieve a distribution of traffic.

[0054]

Next, a description will be given of the fourth embodiment while referring to Fig. 15. The fourth embodiment shown in Fig. 15 is constructed with a group control section 133 and a group control data storage table 134 provided in the PHS exchange 126 in a system that is formed by connecting high output base stations (CS) 127 to 132 to the PHS exchange 126, and by further providing an over channel limit notification section 141 and a transmission output control section 142 in each of the base stations 127 to 132.

[0055]

The high output base stations 127 to 132 are base stations having the areas 135 to 140 that cover a range with a radius of 1 to 1.5 km. In one base station, it is necessary to cover the 1 to 1.5 km radius range with the stipulated three communication channels (i.e. the three channels), however, because it is not possible to deal with all the traffic with

three channels, the base stations are arranged close together so that a plurality of areas overlap.

[0056]

If this type of arrangement is employed, the control channels give rise to interference and become unable to perform normal transmissions to the terminals. Therefore, a structure is employed in which the base stations are synchronized so that interference is prevented.

[0057]

The group control section 133 forms a single group from three or more base stations whose areas overlap each other and sets the control channel level of one base station in each group at the maximum. The group control section 133 implements the maximum transmission output control so that this instruction to set the level at the maximum is performed such that the areas of the base stations having the maximum transmission output in adjacent groups are not adjacent to each other. In addition, the maximum transmission output instruction is performed for a base station that has an available communication channel.

[0058]

The group control data that is referred to in order for the maximum transmission output control to be performed is stored in Table 134. The group control data shows in which group a base station is located and also shows the sequence of base stations whose transmission output is to be set at the maximum in order to perform the maximum transmission output control.

[0059]

The over channel limit notification section 141 notifies the group control section 133 that the entire three channels stipulated for one area are currently in use. The transmission output control section 142 controls the intensity of the level of the control channel signals and, when the stipulated three channels are all in use, lowers the level of the control channel signals and performs control to set at maximum the level of a control channel signal in accordance with a maximum transmission output instruction from the group control section 133.

[0060]

In a structure such as this, let it be assumed that the first to third base stations 127 to 129 form the first group and the fourth to sixth base stations 130 to 132 adjacent to these form the second group. At this point, it will be taken that the transmission outputs of the second base station 128 and the fifth base station 131 are set at the maximum.

[0061]

Here, let it be assumed that three unillustrated within area 136 are performing communication. The over channel limit notification section 141 notifies the group control section 133 that the entire three channels stipulated for one area are currently in use. At this time, the transmission output control section 142 of the second base station 128 lowers the control channel level.

[0062]

By referring to the table 134, the group control channel

section 133 that receives this notification forms the area 135 that is not adjacent to the area 139 of the fifth base station 131 and also issues an instruction to set at the maximum the control channel level of the first base station 127 that has an available communication channel. In accordance with this instruction, the transmission output control section 142 of the first base station 127 sets the control channel level at the maximum.

[0063]

Thereafter, in the same manner, in the first and second groups, the maximum transmission output control is performed resulting in the traffic being distributed. Instead of the transmission output control section 142, it is also possible to provided regulating signal transmission section 123 shown in Fig. 13 described in the second embodiment.

[0064]

In this case, when it is detected by the over channel limit notification section 141 that the entire three channels stipulated for one area are currently in use, the regulating signal transmission section 123 waits for a regulating signal informing it that the relevant base station cannot at this time be used and then transits this signal to the terminals.

[0065]

Furthermore, instead of the transmission output control section 142, it is possible to provide the control channel on/off section 125 shown in Fig. 14 described in the third embodiment. In this case, when it is detected by the over channel limit

notification section 141 that the entire three channels stipulated for one area are currently in use, the control channel on/off section 125 turns off the transmission of control channel signals transmitted from the relevant base station.

[0066]

[Effects of the Invention]

As has been described above, according to the present invention, the effect is achieved of being able to distribute traffic concentrated in a particular base station to other base stations.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a view showing the principle behind the present invention.

Fig. 2 is a view for describing the PHS traffic load distribution method of the first embodiment of the present invention.

Fig. 3 is a view showing the feature elements of a base station of the first embodiment shown in Fig. 2.

Fig. 4 is a view of the first traffic concentration detection structure.

Fig. 5 is a view for describing the sequence of the first traffic concentration detection operation.

Fig. 6 is a view of the second traffic concentration detection structure.

Fig. 7 is a view for describing the sequence of the second traffic concentration detection operation.

Fig. 8 is an explanatory view of the position registration

areas (i.e. the comprehensive call areas).

Fig. 9 is an explanatory view of the third traffic concentration detection structure.

Fig. 10 is a structural view of the third traffic concentration detection operation.

Fig. 11 is an explanatory view of the comprehensive call area number alteration processing.

Fig. 12 is a view for describing the sequence of the third traffic concentration detection operation.

Fig. 13 is a block diagram of the structure of a base station according to the PHS traffic load distribution method of the second embodiment of the present invention.

Fig. 14 is a block diagram of the structure of a base station according to the PHS traffic load distribution method of the third embodiment of the present invention.

Fig. 15 is a view of the system structure according to the PHS traffic load distribution method of the fourth embodiment of the present invention.

Fig. 16 is a view of the PHS system structure.

Fig. 17 is a view for describing the conventional problems.

[Description of the Reference Numerals]

20, 21 Base stations

25 Traffic concentration detection means

26 Transmission output control means

27, 28 Communication areas of the base stations 20 and 21

33 Communication areas created when a control channel level is raised.

34 Communication areas created when a control channel level is lowered.

36 to 41 Terminals

FIGURES

Fig. 1

PRINCIPLE BEHIND THE PRESENT INVENTION

20 BASE STATION

21 BASE STATION

25 TRAFFIC CONCENTRATION DETECTION MEANS

26 TRANSMISSION OUTPUT CONTROL MEANS

36 TERMINAL

28 AREA

Fig. 2

FIRST EMBODIMENT

1 PHS EXCHANGE

20 BASE STATION

21 BASE STATION

22 BASE STATION

23 BASE STATION

AREA AREA AREA AREA

Fig. 3

VIEW OF THE FEATURE ELEMENTS OF A BASE STATION SHOWN IN FIG. 2

BASE STATION

25 TRAFFIC CONCENTRATION DETECTION SECTION

26 TRANSMISSION OUTPUIT CONTROL SECTION

Fig. 4

FIRST TRAFFIC COCENTRATION DETECTION STRUCTURE

45 CALL LOSS NUMBER TABLE

45 ID STORAGE CONTROL SECTION

47 DETERMINATION SECTION

Fig. 5

FIRST TRAFFIC CONCENTRATION DETECTION OPERATION SEQUENCE

TERMINAL BASE STATION

49 LINK CHANNEL ESTABLISHMENT REQUEST

48 THREE CHANNELS IN USE

51 LINK CHANNEL ALLOCATION DENIED

50 REGISTER ID IN CALL LOSS NUMBER TABLE

FOUR REGISTERED

52 LINK CHANNEL ESTABLISHMENT REQUEST

53 REGISTER ID IN CALL LOSS NUMBER TABLE

54 LINK CHANNEL ALLOCATION DENIED

55 TRAFFIC CONCENTRATION DETECTED

Fig. 6

SECOND TRAFFIC CONCENTRATION DETECTION STRUCTURE

57 MAINTENANCE CENTER

58 ID COLLECTION INSTRUCTION SECTION

21 BASE STATION

59 ID NOTIFICATION REQUEST CONTROL SECTION

50 DETERMINATION SECTION

25 TRAFFIC CONCENTRATION DETECTION SECTION

Fig. 7

SECOND TRAFFIC CONCENTRATION DETECTION OPERATION SEQUENCE

TERMINAL TERMINAL TERMINAL

BASE STATION BASE STATION BASE STATION

MAINTENANCE CENTER: 57

61 TRANSMIT TO AREA WHERE TRAFFIC CONCENTRATION IS PREDICTED

62 ID COLLECTION INSTRUCTION

NOTIFICATION INFORMATION

NOTIFICATION INFORMATION

(ID NOTIFICATION REQUEST)

ID NOTIFICATION

65 COUNT ID NUMBERS OVER THRESHOLD VALUE

66 TRAFFIC CONCENTRATION DETECTED

Fig. 8

POSITION REGISTRATION AREAS (COMPREHENSIVE CALL AREAS)

PHS EXCHANGE

POSITION REGISTRATION AREA (COMPREHENSIVE CALL AREA)

POSITION REGISTRATION AREA

Fig. 9

THIRD TRAFFIC CONCENTRATION DETECTION

PHS EXCHANGE

Fig. 10

THIRD TRAFFIC CONCENTRATION DETECTION STRUCTURE

PHS EXCHANGE

108 FALSE AREA REGISTRATION INSTRUCTION SECTION

BASE STATION

109 COMPREHENSIVE CALL AREA NUMBER ALTERATION SECTION

110 DETERMINATION SECTION

25 TRAFFIC CONCENTRATION DETECTION SECTION

Fig. 11

COMPREHENSIVE CALL AREA NUMBER ALTERATION PROCESSING

(a)

112 OPERATOR IDENTIFICATION SYMBOL

113 COMPREHENSIVE CALL AREA NUMBER

114 ADDITIONAL ID

115 NOTIFICATION INFORMATION

9 BITS n BITS 33-n BITS

n BITS ARE SHOWN IN NOTIFICATION INFORMATION

(b)

NORMAL BASE STATION

COMPREHENSIVE CALL AREA NUMBER = 42

NOTIFICATION INFORMATION

(COMPREHENSIVE CALL AREA NUMBER LENGTH = 16)

(C)

PARTICULAR BASE STATION

COMPREHENSIVE CALL AREA NUMBER = 2

NOTIFICATION INFORMATION

(COMPREHENSIVE CALL AREA NUMBER LENGTH = 12)

Fig. 12

THIRD TRAFFIC CONCENTRATION DETECTION OPERATION SEQUENCE

TERMINAL TERMINAL TERMINAL

BASE STATION BASE STATION BASE STATION

PHS EXCHANGE: 1

117 TRANSMIT TO AREA WHERE TRAFFIC CONCENTRATION IS PREDICTED

118 FALSE AREA REGISTRATION INSTRUCTION

NOTIFICATION INFORMATION

NOTIFICATION INFORMATION

120 POSITION REGISTRATION AREA ALTERATION DETECTION

121 POSITION REGISTRATION REQUEST

Fig. 13

SECOND EMBODIMENT

BASE STATION

25 TRAFFIC CONCENTRATION DETECTION SECTION

123 REGULATING SIGNAL TRANSMISSION SECTION

Fig. 14

THIRD EMBODIMENT

BASE STATION

25 TRAFFIC CONCENTRATION DETECTION SECTION

125 CONTROL CHANNEL ON/OFF SECTION

Fig. 15

FOURTH EMBODIMENT

126 PHS EXCHANGE

134 GROUP CONTROL DATA STORAGE TABLE

133 GROUP CONTROL SECTION

AREA AREA AREA AREA AREA AREA

FIRST GROUP SECOND GROUP

141 OVER CHANNEL LIMIT NOTIFICATION SECTION

142 TRANSMISSION OUTPUT CONTROL SECTION

Fig. 16

PHS SYSTEM STRUCTURE

1 PHS EXCHANGE

2 PUBLIC TELEPHONE NETWORK

APPROXIMATELY 100 TO 200m

Fig. 17

CONVENTIONAL PROBLEMS

BASE STATION BASE STATION BASE STATION

CONTROL CHANNEL CONTROL CHANNEL CONTROL CHANNEL

AREA AREA AREA

09926267

PATENT ABSTRACTS OF JAPAN

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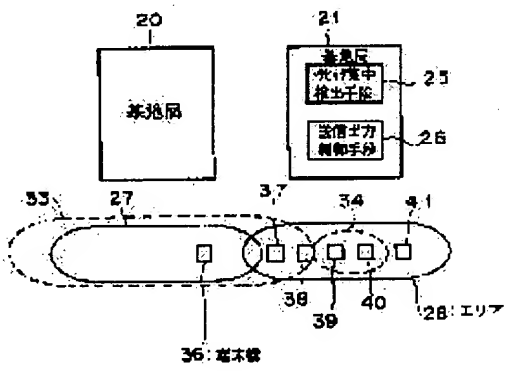
(72)Inventor : MATSUMURA GAKUO

(54) TRAFFIC LOAD DISTRIBUTING METHOD FOR MOBILE COMMUNICATION SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a traffic load distributing method for mobile communication system by which the traffic concentrated at a specified base station can be distributed to other base stations.

SOLUTION: Base stations 20 and 21 are provided with a means 25 for detecting the state of concentrated traffic exceeding a specified speech enable channel caused by the concentration of terminal equipment 37-41 into a formed speech area 28 of present base station 21 and control means 26 for decreasing the control channel signal level of present base station 21 at the time of that detection, instructing the increase of signal level to peripheral base stations 20 and increasing the signal level corresponding to the instructions from the peripheral base stations 20. Then, the speech area is reduced as shown by 34 by lowering the signal level of base station 21 in the state of concentrating traffic, and the speech area is extended as shown by 33 increasing the level of peripheral base stations 20. Thus, the terminal equipment 37 and 38, which receive the control channel signal of base station 21 up to the moment, can enter the speech area 33 to receive the signal of base station 20.



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[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] It is a traffic load distribution method in the migration communication system which distributes the traffic concentrated on one base station to other base stations. A traffic intensive detection means to detect the traffic concentration condition exceeding the channel by a terminal focusing on the message area which a self-base station forms which can be convention talked over the telephone, While lowering the control channel signal level of this self-base station at the time of this traffic concentration condition detection A transmitting output-control means to perform control which performs the directions which raise control channel signal level to a circumference base station, and raises this control channel signal level according to these directions from a circumference base station is provided in a base station. The traffic load distribution method in the migration communication system characterized by performing taking up and down of said control channel signal level so that the terminal of the message area neighborhood of said circumference base station in the message area of said self-base station may enter in the message area of this circumference base station.
[Claim 2] The traffic load distribution method in the migration communication system according to claim 1 characterized by providing a regulation signal transmitting means to await the regulation signal which tells that use of an applicable base station is impossible instead of said transmitting output-control means when said traffic concentration condition is detected, and to transmit to a terminal.
[Claim 3] The traffic load distribution method in the migration communication system according to claim 1 characterized by providing control channel ON / an off means to stop the control channel signal under transmission instead of said transmitting output-control means when said traffic concentration condition is detected.
[Claim 4] The table on which the specific number of said terminal is memorized in said traffic intensive detection means, A storage control means to remember the specific number of a call loss generating terminal that the same thing does not lap on this table, The traffic load distribution method in migration communication system given in any of claims 1-3 characterized by providing and constituting a judgment means to judge with said traffic concentration condition when the number of the specific numbers memorized by this table exceeds a setting threshold in the setup time they are.
[Claim 5] A collection directions means to perform collection directions of said specific number to this base station is prepared for the exchange by which said base station was connected. The report-request control means which puts the report request of a specific number on information information, and transmits said traffic intensive detection means to a terminal according to these collection directions, The number of specific numbers reported according to this report request is counted. The traffic load distribution method in migration communication system given in any of claims 1-3 characterized by providing and constituting a judgment means to judge with a traffic concentration condition when this number of counts exceeds a setting threshold in the setup time they are.
[Claim 6] A registration directions means to give the registration directions which make false area arbitration area in general calling area to the exchange by which said base station was connected is established. A modification means to change said traffic intensive detection means into a different false

general calling area number from a general calling area number according to these registration directions, The number of location registration demands from the terminal which received this false general calling area number is counted. The traffic load distribution method in migration communication system given in any of claims 1-3 characterized by providing and constituting a judgment means to judge with a traffic concentration condition when this number of counts exceeds a setting threshold in the setup time they are.

[Claim 7] The traffic load distribution method in the migration communication system according to claim 6 with which said modification means is characterized by changing into said false general calling area number by changing the bit length of said general calling area number.

[Claim 8] It is a traffic load distribution method in the migration communication system to which the base station of the high power mold which forms large message area in the exchange was connected. Two or more base stations with which area laps mutually are made into one group. A group control means to perform the directions which make max control channel level of one base station in each group to the base station which has an opening in a message channel so that the area of the base station where a contiguity group's control channel level is made into max may not adjoin is provided in the exchange. A channel limit exaggerated notice means to notify that all the message channels of the number of conventions were buried in one area to this group control means, when these all message channels are buried, while lowering control channel signal level The traffic load distribution method in the migration communication system characterized by providing the transmitting output-control means which makes this control channel signal level max according to the directions which make max this control channel level from a group control means in a base station.

[Claim 9] The traffic load distribution method in the migration communication system according to claim 8 characterized by providing a regulation signal transmitting means to await the regulation signal which tells that use of an applicable base station is impossible instead of said transmitting output-control means when said all message channels are buried, and to transmit to a terminal.

[Claim 10] The traffic load distribution method in the migration communication system according to claim 8 characterized by providing control channel ON / an off means to stop the control channel signal under transmission when said all message channels are buried instead of said transmitting output-control means.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the traffic load distribution method in migration communication system. Especially the traffic load distribution method in this migration communication system is applied to a Personal Handyphone System (PHS). The message channel per one base station is regulated by legal criteria with three channels, and the case where it cannot talk over the telephone generates PHS in the area in which many men gather. Then, the method which can cover a message in such an area is demanded.
[0002]
[Description of the Prior Art] The system configuration Fig. of PHS is shown in drawing 16 , and the explanation is given. The sign 1 shown in this drawing is the PHS exchange connected to the public network 2. 3, 4, and 5 are two or more base stations (CS) by which cable connection was made at the PHS exchange 1, and each forms the about 100-200m message area 6, 7, and 8 by the transmitted electric wave.
[0003] The migration telephone (it is henceforth called a terminal) which is not illustrated is in any of that message area 6, 7, and 8 they are, the control channel signal of the highest level transmitted from each base stations 3-5 is chosen, and it telephones to a partner by performing dispatch/arrival through this selection base station (any of 3-5 are they?).
[0004]
[Problem(s) to be Solved by the Invention] By the way, in PHS mentioned above, there were few message channels per one base station as three channels, traffic concentrated and there was a problem which the case where it cannot talk over the telephone generates in the area in which many men gather.
[0005] When three terminals 12, 13, and 14 which exist in each area 6-8 of drawing 16 in area 7 in drawing 17 which filled in terminals 10-18 perform dispatch/arrival through the 2nd base station 4, it becomes impossible for example, for other two base stations 15 and 16 which exist in the same area 7 to perform dispatch/arrival.
[0006] Other terminals 15 and 16 move in the area 6 and the eight directions, for performing dispatch/arrival through other base stations 3 and 5, and even the point with which a base station 3 or the level of 5 becomes high needs to move, and it is necessary to choose a base station 3 or the control channel signal of 5 from the level of the control channel signal of a base station 4.
[0007] Since it is rare to concentrate on specific area since the person holding terminals 10-18 is in a walk time in the usual case, traffic is distributed and the problem mentioned above is seldom produced. However, at a stadium or a theater, a terminal without migration focuses on specific area, traffic will concentrate on a specific base station by this, and the problem mentioned above will arise.
[0008] This invention is made in view of such a point, and aims at offering the traffic load distribution method in the migration communication system which can make other base stations distribute the traffic concentrated on the specific base station.
[0009]

[Means for Solving the Problem] The principle Fig. of this invention is shown in drawing 1 . The traffic load distribution method in the migration communication system shown in this drawing It is what distributes the traffic concentrated on one base station to other base stations. The description of this invention A traffic intensive detection means 25 to detect the traffic concentration condition exceeding the channel by terminals 37, 38, 39, 40, and 41 focusing on the message area 28 which the self-base station 21 forms which can be convention talked over the telephone, While lowering the control channel signal level of the self-base station 21 at the time of traffic concentration condition detection A transmitting output-control means 26 to perform control which performs the directions which raise control channel signal level to the circumference base station 20, and raises control channel signal level according to directions of the point from the circumference base station 20 is provided in base stations 20 and 21. It is in having constituted so that taking up and down of control channel signal level might be performed so that the terminals 37 and 38 of the message area 27 neighborhood of the circumference base station 20 in the message area 28 of the self-base station 21 may enter in the message area 33 of the circumference base station 20.

[0010] That is, by lowering the control channel signal level of the base station 21 of a traffic concentration condition, as the ellipse 34 of a broken line shows, message area is reduced. By raising the control channel signal level of the circumference base station 20, as the ellipse 33 of a broken line shows, message area is expanded. By this, the terminals 37 and 38 which had received the control channel signal of a base station 21 until now go into the message area 33, and come to receive the control channel signal of a base station 20.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 2 is drawing for explaining the traffic load distribution method in PHS of the 1st operation gestalt of this invention. However, the public network 2 shown in drawing 16 in this drawing 2 was omitted.

[0012] In drawing 2 , signs 20, 21, 22, and 23 are two or more base stations, as shown in drawing 3 , possess the traffic concentration detecting element 25 and the transmitting output-control section 26 which are the description element of this invention, and are constituted.

[0013] It detects that the traffic of the predetermined number exceeding the channel (three channels) which can be convention talked over the telephone concentrated the traffic concentration detecting element 25 on the specific base station when a terminal focused on one message area which a base station forms.

[0014] The transmitting output-control section 25 is controlled to control the strength of the level of a control channel signal, and to direct to raise control channel signal level to the circumference base station, while lowering the control channel signal level of the base station which detected the traffic concentration condition (increment directions in a transmitting output), and to raise control channel signal level according to the increment directions in a transmitting output from other base stations.

[0015] For example, it concentrates on a predetermined area so that the terminal shown with signs 36, 37, 38, 39, 40, 41, and 42 when each base stations 20-24 form area in drawing 2 by the control channel signal of the same level, as signs 27, 28, 29, and 30 show may illustrate, and suppose that terminals 37-41 focused on the area 28 which a base station 21 forms by this.

[0016] In this case, when the traffic concentration detecting element 25 of a base station 21 detects a traffic concentration condition, suppose that it directed to raise control channel signal level to the circumference base stations 20 and 22 as the transmitting output-control section 26 of the self-base station 21 lowers control channel signal level and arrow heads 31 and 32 show.

[0017] According to these directions, the transmitting output-control section 26 of the circumference base stations 20 and 22 raises control channel signal level. By the above control, the area 27 and 29 of narrowing and base stations 20 and 22 becomes large like the area shown with signs 33 and 35 like the area which the area 28 of a base station 21 shows with a sign 34.

[0018] And if the terminals 37, 40, and 41 which awaited among the terminals 37-41 which existed in the area 28 before a level control, and were less than holding level go into the area 33 and 35 which

spread by level rise, they will choose the control channel signal of the base stations 20 and 22 which form the area 33 and 35.
[0019] This can distribute the traffic which was being concentrated on the base station 21 to the circumference base stations 20 and 22, and the terminals 37, 40, and 41 which were not able to perform a message will be in the condition which can be talked over the telephone.
[0020] Next, the approach by the 1st which detects the traffic concentration condition which the traffic concentration detecting element 25 mentioned above - the 3rd invention is explained. When the 1st approach memorizes the terminal equipment item number number (it is henceforth called ID) whose base station which carried out the call loss is the specific number of the terminal itself when the call loss from which a call is cut by lock out of a control channel signal in a base station occurs and call loss occurs after that, the same ID ignores, and it counts the memorized number of ID, memorizing different ID which newly produced call loss. And when the number of counts exceeds a predetermined threshold in predetermined time, it judges with a traffic concentration condition.
[0021] That is, if the number of ID memorized by ID storage control section 45, the call loss number table 46 which memorizes ID by control of ID storage control section 45, and this table 46 is counted to the traffic concentration detecting element 25 and this number of counts exceeds a setting threshold, "4", in the setup time to it as shown in drawing 4 , the judgment section 47 judged to be a traffic concentration condition will be formed. [for example,]
[0022] In such a configuration, if the terminal of ID "11111111" performs a link channel probability demand to the base station of 3 subscriber talk state as a sign 48 shows to drawing 5 , since call loss will occur, as a sign 50 shows, ID storage control section 45 registers the ID "11111111" into the call loss number table 46. Under the present circumstances, as a sign 51 shows, link channel allocation refusal is performed to the terminal of ID "11111111."
[0023] Suppose that ID "22222222" from which others differ like this, "33333333", and "44444444" were registered. Here, even if dispatch is performed what times from the terminal of ID registered into the call loss number table 46, ID storage control section 45 does not change the call loss number table 46.
[0024] Next, as a sign 52 shows, when a link channel probability demand is performed from the terminal of ID "55555555", as the ID "55555555" shows with a sign 53, it registers with the call loss number table 46, and suppose that link channel allocation refusal was performed to the terminal of ID "11111111" as a sign 54 showed.
[0025] In this case, since the number of counts of ID in the judgment section 47 is set to "5" exceeding a setting threshold "4", it is judged with a traffic concentration condition and a traffic concentration condition is detected.
[0026] The 2nd approach is explained. As shown in drawing 6 , ID collection directions section 58 which directs to a base station 21 so that a base station 21 may collect ID of a terminal (ID collection directions) is formed in the maintenance center 57 of the PHS exchange to which the base station 21 was connected.
[0027] Moreover, according to those ID collection directions, it awaits to a base station, and ID report-request control section 59 which carries ID report request at information information, and transmits at the terminal of a condition, and the judgment section 60 judged to be a traffic concentration condition when the number of ID reported according to ID report request is counted and this number of counts exceeds a predetermined threshold in predetermined time are formed.
[0028] In such a configuration, as a sign 61 shows to drawing 7 , ID collection directions section 58 of a maintenance center 57 sends out ID collection directions shown with a sign 62 to the base station 21 which forms the area where traffic concentration is expected.
[0029] By this, as a sign 63 shows, it exists in the area of a base station 21, and ID report-request control section 59 of a base station 21 awaits, puts on two or more terminals of a condition at information information, and transmits ID report request.
[0030] The judgment section 60 counts ID shown with the sign 64 transmitted from each terminal according to this demand. As a sign 65 shows, when this number of counts is over the setting threshold

in predetermined time, a traffic concentration condition is detected by judging with a traffic concentration condition, as a sign 66 shows.

[0031] The 3rd approach is explained. This approach uses location registration area (general calling area). It is prepared in order to determine which area the PHS exchange 1 which received arrival of the mail from the public network which general calling area is the large area 78 or the thing of 85 which includes two or more base stations 68-72 shown in drawing 8 , the area 73-77 of 79-81, or 82 to 84 group, and is not illustrated should just call.

[0032] Usually, a terminal 87 memorizes a general calling area number from the contents of information information, when a power source is turned ON, and it transmits a location registration demand to a base station 70. The general calling area 78 which calls a terminal 87 from the PHS exchange 1 by this is determined.

[0033] At this time, even if a terminal 87 moves [in the inside of the general calling area 78] where, it does not perform a location registration demand. Henceforth, the timing which performs location registration is a time of the general calling area number of information information differing from what the terminal 87 has memorized, when the general calling area 78 is left and it goes into other general calling area 85.

[0034] All the general calling area numbers of the information information transmitted from the base stations 68-72 in the same location registration area 78 are the same. For this reason, a terminal 87 performs a location registration demand.

[0035] Then, the 3rd approach is in the general calling area 105 formed of 97 to area 104 group of terminals 89-96, as shown in drawing 9 . They are other general calling area (henceforth) in false about the area 100,101 which a terminal is likely to concentrate. When it is called false area, it pretends that a sign 106 shows and a terminal moves to that false area 106, a location registration demand is made to transmit, and when the number of these transmitting location registration demands exceeds a setting threshold in predetermined time, it is made to judge with a traffic concentration condition.

[0036] In order to realize this approach, as shown in drawing 10 , the false area registration directions section 108 is formed in the PHS exchange 1, and the general calling area changed-number section 109 and the judgment section 110 are prepared and constituted in the traffic concentration detecting element 25 of base stations 92 and 93.

[0037] The false area registration directions section 108 performs false area registration directions to the base stations 92 and 93 which form the area 100,101 to make into the false area 106, as shown in drawing 9 .

[0038] The general calling area changed-number section 109 changes a general calling area number according to false area registration directions. This modification processing is explained with reference to drawing 11 . General calling area changed-number processing changes the general calling area number length in the information information from an applicable base station.

[0039] As shown in drawing 11 (a), the configuration of the transmitting information information on a terminal has been the information information shown by the 33-n-bit addition ID shown by the entrepreneur identification code of 9 bits shown by 112, the general calling area number of n bits shown by 113, and 114, and 115, and n bits of a general calling area number length are shown in the information information 115.

[0040] For example, as shown in (b), general calling area number-length =16 bit is shown in information information, and suppose that the general calling area number was "0000000000101010:binary number" = "42:decimal number." If it is usual, "42" of the general calling area number will be notified.

[0041] However, by the general calling area changed-number section 109, as the area is shown in (c) in a specific base station to make into false area, the general calling area number length in information information is changed into 12 bits. By this, a general calling area number becomes "000000000010:binary number" = "the number of 2:10 **."

[0042] The judgment section 110 judges with a traffic concentration condition, when the number of the location registration demands which have transmitted when a terminal goes into the false area 106 exceeds a setting threshold in predetermined time.

[0043] In such a configuration, as a sign 61 shows to drawing 12 , the false area registration directions section 108 of the PHS exchange 1 sends out the false area registration directions shown with a sign 118 to the base stations 92 and 93 which form the area where traffic concentration is expected.
[0044] According to these directions, the general calling area changed-number section 109 of base stations 92 and 93 changes a general calling area number. Although this changed general calling area number is put on information information and transmitted to a terminal, suppose that two or more terminals included in false area received the information information on the base station 92 shown with a sign 119 in this case.
[0045] In this case, each terminal detects modification of location registration area (general calling area), as a sign 120 shows, and it newly memorizes "2" of a general calling area number by performing a location registration demand to a base station 92, as a sign 121 shows.
[0046] Moreover, the judgment section 110 of a base station 92 detects a traffic concentration condition by judging with a traffic concentration condition, when the number of location registration demands is counted and this number of counts exceeds a setting threshold in predetermined time.
[0047] Next, the 2nd operation gestalt is explained with reference to drawing 13 . However, the same sign is given to the part corresponding to each part of the 1st operation gestalt shown in drawing 2 and drawing 3 in the 2nd operation gestalt shown in drawing 13 , and the explanation is omitted.
[0048] The description of the 2nd operation gestalt shown in drawing 13 is having formed the regulation signal transmitting section 123 in base stations 20-23. When a traffic concentration condition is detected by the traffic concentration detecting element 25, the regulation signal transmitting section 123 awaits the regulation signal with which use of an applicable base station tells that current is impossible, and transmits to a terminal.
[0049] For example, in the base station 21 shown in drawing 2 , supposing a traffic concentration condition is detected, the regulation signal transmitting section 123 will await the regulation signal with which use of the applicable base station 21 tells that the present is impossible, and it will transmit to terminals 28, 40, and 41.
[0050] Each terminals 28, 40, and 41 which received the regulation signal change to the control channel of the circumference base stations 20 and 22. This can distribute the traffic which was being concentrated on the base station 21 to the circumference base stations 20 and 22.
[0051] Next, the 3rd operation gestalt is explained with reference to drawing 14 . However, the same sign is given to the part corresponding to each part of the 2nd operation gestalt shown in drawing 13 in the 3rd operation gestalt shown in drawing 14 , and the explanation is omitted.
[0052] The description of the 3rd operation gestalt shown in drawing 14 is having formed control channel ON / OFF section 125 in base stations 20-23. Control channel ON / off section 125 makes off transmission of the control channel signal transmitted from the applicable base station, when a traffic concentration condition is detected by the traffic concentration detecting element 25. Moreover, when it comes to traffic concentration condition un-detecting, it sets to ON again.
[0053] Thus, by suspending transmission of a control channel signal compulsorily, it awaits, the change of the control channel to other base stations is urged to a terminal, and distribution of traffic is aimed at.
[0054] Next, the 4th operation gestalt is explained with reference to drawing 15 . In the system which (base station CS) 127-132 of a high power mold are connected to the PHS exchange 126, and is constituted, the 4th operation gestalt shown in this drawing 15 forms the group control section 133 and the group control data storage table 134 in the PHS exchange 126, and prepares and constitutes the channel limit exaggerated notice section 141 and the transmitting output-control section 142 in each base stations 127-132 further.
[0055] In the base stations 127-132 of a high power mold, it is a base station with the area 135-140 which covers the range of 1-1.5km radius. Although the range of 1-1.5km radius must be covered by regular 3 message channels (three channels) in one base station, since traffic is not well sold for three channels, the base station has been densely installed so that two or more area may overlap.
[0056] Moreover, since a control channel interferes, there is and it becomes impossible to transmit to a terminal normally when such installation is performed, it is constituted so that the synchronization

between base stations may be taken and interference may be prevented.
[0057] The group control section 133 carries out the maximum transmitting output control which performs the directions which make one group three or more base stations with which area laps mutually, make max control channel level of one base station in each group, and are made into this max so that the area of the base station a contiguity group's maximum transmitting output may not adjoin. Moreover, the maximum transmitting output directions are performed to the base station which has an opening in a message channel.
[0058] The group control data referred to in order to perform the maximum transmitting output control are stored in the table 134. In order to perform the maximum transmitting output control, group control data show the sequence of the base station which makes a transmitting output max, while showing in which group a base station exists.
[0059] The channel limit exaggerated notice section 141 notifies that all of three channels of a convention were buried in one area to the group control section 133. The transmitting output-control section 142 controls the strength of the level of a control channel signal, and it performs control which makes control channel signal level max according to the maximum transmitting output directions from the group control section 133 while it lowers control channel signal level, when all of three channels of a convention are buried.
[0060] In such a configuration, the 4th - the 6th base station 130-132 where the 1st - the 3rd base station 127-129 adjoin the 1st group and this are made with the 2nd group, and suppose at present that the transmitting output of the 2nd base station 128 and the 5th base station 131 is made with max.
[0061] Here, supposing three terminals which are not illustrated in area 136 talk over the telephone, the channel limit exaggerated notice section 141 will notify that all of three channels of a convention were buried to the group control section 133. At this time, the transmitting output-control section 142 of the 2nd base station 128 lowers control channel level.
[0062] By referring to a table 134, the group control section 133 which received this notice performs the directions which make max control channel level of the 1st base station 127 which has an opening in a message channel while forming the area 135 which does not adjoin the area 139 of the 5th base station 131. According to these directions, the transmitting output-control section 142 of the 1st base station 127 makes control channel level max.
[0063] The maximum transmitting output control will be performed in the 1st and 2nd groups similarly hereafter, and distribution of traffic will be performed by this. Moreover, the regulation signal transmitting section 123 shown in drawing 13 explained with the 2nd operation gestalt instead of the transmitting output-control section 142 may be formed.
[0064] In this case, when it is detected that all of three channels of a convention were buried with the channel limit exaggerated notice section 141, the regulation signal transmitting section 123 awaits the regulation signal with which use of an applicable base station tells that current is impossible, and it transmits to a terminal.
[0065] Furthermore, control channel ON / OFF section 125 shown in drawing 14 explained with the 3rd operation gestalt instead of the transmitting output-control section 142 may be formed. In this case, when it is detected that all of three channels of a convention were buried with the channel limit exaggerated notice section 141, control channel ON / off section 125 makes off transmission of the control channel signal transmitted from the applicable base station.
[0066]
[Effect of the Invention] As explained above, according to this invention, it is effective in the ability to make other base stations distribute the traffic concentrated on the specific base station.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the traffic load distribution method in migration communication system. Especially the traffic load distribution method in this migration communication system is applied to a Personal Handyphone System (PHS). The message channel per one base station is regulated by legal criteria with three channels, and the case where it cannot talk over the telephone generates PHS in the area in which many men gather. Then, the method which can cover a message in such an area is demanded.

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PRIOR ART

[Description of the Prior Art] The system configuration Fig. of PHS is shown in drawing 16 , and the explanation is given. The sign 1 shown in this drawing is the PHS exchange connected to the public network 2. 3, 4, and 5 are two or more base stations (CS) by which cable connection was made at the PHS exchange 1, and each forms the about 100-200m message area 6, 7, and 8 by the transmitted electric wave.
[0003] The migration telephone (it is henceforth called a terminal) which is not illustrated is in any of that message area 6, 7, and 8 they are, the control channel signal of the highest level transmitted from each base stations 3-5 is chosen, and it telephones to a partner by performing dispatch/arrival through this selection base station (any of 3-5 are they?).

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, it is effective in the ability to make other base stations distribute the traffic concentrated on the specific base station.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, in PHS mentioned above, there were few message channels per one base station as three channels, traffic concentrated and there was a problem which the case where it cannot talk over the telephone generates in the area in which many men gather.
[0005] When three terminals 12, 13, and 14 which exist in each area 6-8 of drawing 16 in area 7 in drawing 17 which filled in terminals 10-18 perform dispatch/arrival through the 2nd base station 4, it becomes impossible for example, for other two base stations 15 and 16 which exist in the same area 7 to perform dispatch/arrival.
[0006] Other terminals 15 and 16 move in the area 6 and the eight directions, for performing dispatch/arrival through other base stations 3 and 5, and even the point with which a base station 3 or the level of 5 becomes high needs to move, and it is necessary to choose a base station 3 or the control channel signal of 5 from the level of the control channel signal of a base station 4.
[0007] Since it is rare to concentrate on specific area since the person holding terminals 10-18 is in a walk time in the usual case, traffic is distributed and the problem mentioned above is seldom produced. However, at a stadium or a theater, a terminal without migration focuses on specific area, traffic will concentrate on a specific base station by this, and the problem mentioned above will arise.
[0008] This invention is made in view of such a point, and aims at offering the traffic load distribution method in the migration communication system which can make other base stations distribute the traffic concentrated on the specific base station.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] The principle Fig. of this invention is shown in drawing 1 . The traffic load distribution method in the migration communication system shown in this drawing It is what distributes the traffic concentrated on one base station to other base stations. The description of this invention A traffic intensive detection means 25 to detect the traffic concentration condition exceeding the channel by terminals 37, 38, 39, 40, and 41 focusing on the message area 28 which the self-base station 21 forms which can be convention talked over the telephone, While lowering the control channel signal level of the self-base station 21 at the time of traffic concentration condition detection A transmitting output-control means 26 to perform control which performs the directions which raise control channel signal level to the circumference base station 20, and raises control channel signal level according to directions of the point from the circumference base station 20 is provided in base stations 20 and 21. It is in having constituted so that taking up and down of control channel signal level might be performed so that the terminals 37 and 38 of the message area 27 neighborhood of the circumference base station 20 in the message area 28 of the self-base station 21 may enter in the message area 33 of the circumference base station 20.
[0010] That is, by lowering the control channel signal level of the base station 21 of a traffic concentration condition, as the ellipse 34 of a broken line shows, message area is reduced. By raising the control channel signal level of the circumference base station 20, as the ellipse 33 of a broken line shows, message area is expanded. By this, the terminals 37 and 38 which had received the control channel signal of a base station 21 until now go into the message area 33, and come to receive the control channel signal of a base station 20.
[0011]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. Drawing 2 is drawing for explaining the traffic load distribution method in PHS of the 1st operation gestalt of this invention. However, the public network 2 shown in drawing 16 in this drawing 2 was omitted.
[0012] In drawing 2 , signs 20, 21, 22, and 23 are two or more base stations, as shown in drawing 3 , possess the traffic concentration detecting element 25 and the transmitting output-control section 26 which are the description element of this invention, and are constituted.
[0013] It detects that the traffic of the predetermined number exceeding the channel (three channels) which can be convention talked over the telephone concentrated the traffic concentration detecting element 25 on the specific base station when a terminal focused on one message area which a base station forms.
[0014] The transmitting output-control section 25 is controlled to control the strength of the level of a control channel signal, and to direct to raise control channel signal level to the circumference base station, while lowering the control channel signal level of the base station which detected the traffic concentration condition (increment directions in a transmitting output), and to raise control channel signal level according to the increment directions in a transmitting output from other base stations.
[0015] For example, it concentrates on a predetermined area so that the terminal shown with signs 36,

37, 38, 39, 40, 41, and 42 when each base stations 20-24 form area in drawing 2 by the control channel signal of the same level, as signs 27, 28, 29, and 30 show may illustrate, and suppose that terminals 37-41 focused on the area 28 which a base station 21 forms by this.

[0016] In this case, when the traffic concentration detecting element 25 of a base station 21 detects a traffic concentration condition, suppose that it directed to raise control channel signal level to the circumference base stations 20 and 22 as the transmitting output-control section 26 of the self-base station 21 lowers control channel signal level and arrow heads 31 and 32 show.

[0017] According to these directions, the transmitting output-control section 26 of the circumference base stations 20 and 22 raises control channel signal level. By the above control, the area 27 and 29 of narrowing and base stations 20 and 22 becomes large like the area shown with signs 33 and 35 like the area which the area 28 of a base station 21 shows with a sign 34.

[0018] And if the terminals 37, 40, and 41 which awaited among the terminals 37-41 which existed in the area 28 before a level control, and were less than holding level go into the area 33 and 35 which spread by level rise, they will choose the control channel signal of the base stations 20 and 22 which form the area 33 and 35.

[0019] This can distribute the traffic which was being concentrated on the base station 21 to the circumference base stations 20 and 22, and the terminals 37, 40, and 41 which were not able to perform a message will be in the condition which can be talked over the telephone.

[0020] Next, the approach by the 1st which detects the traffic concentration condition which the traffic concentration detecting element 25 mentioned above - the 3rd invention is explained. When the 1st approach memorizes the terminal equipment item number number (it is henceforth called ID) whose base station which carried out the call loss is the specific number of the terminal itself when the call loss from which a call is cut by lock out of a control channel signal in a base station occurs and call loss occurs after that, the same ID ignores, and it counts the memorized number of ID, memorizing different ID which newly produced call loss. And when the number of counts exceeds a predetermined threshold in predetermined time, it judges with a traffic concentration condition.

[0021] That is, if the number of ID memorized by ID storage control section 45, the call loss number table 46 which memorizes ID by control of ID storage control section 45, and this table 46 is counted to the traffic concentration detecting element 25 and this number of counts exceeds a setting threshold, "4", in the setup time to it as shown in drawing 4 , the judgment section 47 judged to be a traffic concentration condition will be formed. [for example,]

[0022] In such a configuration, if the terminal of ID "11111111" performs a link channel probability demand to the base station of 3 subscriber talk state as a sign 48 shows to drawing 5 , since call loss will occur, as a sign 50 shows, ID storage control section 45 registers the ID "11111111" into the call loss number table 46. Under the present circumstances, as a sign 51 shows, link channel allocation refusal is performed to the terminal of ID "11111111."

[0023] Suppose that ID "22222222" from which others differ like this, "33333333", and "44444444" were registered. Here, even if dispatch is performed what times from the terminal of ID registered into the call loss number table 46, ID storage control section 45 does not change the call loss number table 46.

[0024] Next, as a sign 52 shows, when a link channel probability demand is performed from the terminal of ID "55555555", as the ID "55555555" shows with a sign 53, it registers with the call loss number table 46, and suppose that link channel allocation refusal was performed to the terminal of ID "11111111" as a sign 54 showed.

[0025] In this case, since the number of counts of ID in the judgment section 47 is set to "5" exceeding a setting threshold "4", it is judged with a traffic concentration condition and a traffic concentration condition is detected.

[0026] The 2nd approach is explained. As shown in drawing 6 , ID collection directions section 58 which directs to a base station 21 so that a base station 21 may collect ID of a terminal (ID collection directions) is formed in the maintenance center 57 of the PHS exchange to which the base station 21 was connected.

[0027] Moreover, according to those ID collection directions, it awaits to a base station, and ID report-request control section 59 which carries ID report request at information information, and transmits at the terminal of a condition, and the judgment section 60 judged to be a traffic concentration condition when the number of ID reported according to ID report request is counted and this number of counts exceeds a predetermined threshold in predetermined time are formed.
[0028] In such a configuration, as a sign 61 shows to drawing 7 , ID collection directions section 58 of a maintenance center 57 sends out ID collection directions shown with a sign 62 to the base station 21 which forms the area where traffic concentration is expected.
[0029] By this, as a sign 63 shows, it exists in the area of a base station 21, and ID report-request control section 59 of a base station 21 awaits, puts on two or more terminals of a condition at information information, and transmits ID report request.
[0030] The judgment section 60 counts ID shown with the sign 64 transmitted from each terminal according to this demand. As a sign 65 shows, when this number of counts is over the setting threshold in predetermined time, a traffic concentration condition is detected by judging with a traffic concentration condition, as a sign 66 shows.
[0031] The 3rd approach is explained. This approach uses location registration area (general calling area). It is prepared in order to determine which area the PHS exchange 1 which received arrival of the mail from the public network which general calling area is the large area 78 or the thing of 85 which includes two or more base stations 68-72 shown in drawing 8 , the area 73-77 of 79-81, or 82 to 84 group, and is not illustrated should just call.
[0032] Usually, a terminal 87 memorizes a general calling area number from the contents of information information, when a power source is turned ON, and it transmits a location registration demand to a base station 70. The general calling area 78 which calls a terminal 87 from the PHS exchange 1 by this is determined.
[0033] At this time, even if a terminal 87 moves [in the inside of the general calling area 78] where, it does not perform a location registration demand. Henceforth, the timing which performs location registration is a time of the general calling area number of information information differing from what the terminal 87 has memorized, when the general calling area 78 is left and it goes into other general calling area 85.
[0034] All the general calling area numbers of the information information transmitted from the base stations 68-72 in the same location registration area 78 are the same. For this reason, a terminal 87 performs a location registration demand.
[0035] Then, the 3rd approach is in the general calling area 105 formed of 97 to area 104 group of terminals 89-96, as shown in drawing 9 . They are other general calling area (henceforth) in false about the area 100,101 which a terminal is likely to concentrate. When it is called false area, it pretends that a sign 106 shows and a terminal moves to that false area 106, a location registration demand is made to transmit, and when the number of these transmitting location registration demands exceeds a setting threshold in predetermined time, it is made to judge with a traffic concentration condition.
[0036] In order to realize this approach, as shown in drawing 10 , the false area registration directions section 108 is formed in the PHS exchange 1, and the general calling area changed-number section 109 and the judgment section 110 are prepared and constituted in the traffic concentration detecting element 25 of base stations 92 and 93.
[0037] The false area registration directions section 108 performs false area registration directions to the base stations 92 and 93 which form the area 100,101 to make into the false area 106, as shown in drawing 9 .
[0038] The general calling area changed-number section 109 changes a general calling area number according to false area registration directions. This modification processing is explained with reference to drawing 11 . General calling area changed-number processing changes the general calling area number length in the information information from an applicable base station.
[0039] As shown in drawing 11 (a), the configuration of the transmitting information information on a terminal has been the information information shown by the 33-n-bit addition ID shown by the

entrepreneur identification code of 9 bits shown by 112, the general calling area number of n bits shown by 113, and 114, and 115, and n bits of a general calling area number length are shown in the information information 115.
[0040] For example, as shown in (b), general calling area number-length =16 bit is shown in information information, and suppose that the general calling area number was "0000000000101010:binary number" = "42:decimal number." If it is usual, "42" of the general calling area number will be notified.
[0041] However, by the general calling area changed-number section 109, as the area is shown in (c) in a specific base station to make into false area, the general calling area number length in information information is changed into 12 bits. By this, a general calling area number becomes "000000000010:binary number" = "the number of 2:10 **."
[0042] The judgment section 110 judges with a traffic concentration condition, when the number of the location registration demands which have transmitted when a terminal goes into the false area 106 exceeds a setting threshold in predetermined time.
[0043] In such a configuration, as a sign 61 shows to drawing 12 , the false area registration directions section 108 of the PHS exchange 1 sends out the false area registration directions shown with a sign 118 to the base stations 92 and 93 which form the area where traffic concentration is expected.
[0044] According to these directions, the general calling area changed-number section 109 of base stations 92 and 93 changes a general calling area number. Although this changed general calling area number is put on information information and transmitted to a terminal, suppose that two or more terminals included in false area received the information information on the base station 92 shown with a sign 119 in this case.
[0045] In this case, each terminal detects modification of location registration area (general calling area), as a sign 120 shows, and it newly memorizes "2" of a general calling area number by performing a location registration demand to a base station 92, as a sign 121 shows.
[0046] Moreover, the judgment section 110 of a base station 92 detects a traffic concentration condition by judging with a traffic concentration condition, when the number of location registration demands is counted and this number of counts exceeds a setting threshold in predetermined time.
[0047] Next, the 2nd operation gestalt is explained with reference to drawing 13 . However, the same sign is given to the part corresponding to each part of the 1st operation gestalt shown in drawing 2 and drawing 3 in the 2nd operation gestalt shown in drawing 13 , and the explanation is omitted.
[0048] The description of the 2nd operation gestalt shown in drawing 13 is having formed the regulation signal transmitting section 123 in base stations 20-23. When a traffic concentration condition is detected by the traffic concentration detecting element 25, the regulation signal transmitting section 123 awaits the regulation signal with which use of an applicable base station tells that current is impossible, and transmits to a terminal.
[0049] For example, in the base station 21 shown in drawing 2 , supposing a traffic concentration condition is detected, the regulation signal transmitting section 123 will await the regulation signal with which use of the applicable base station 21 tells that the present is impossible, and it will transmit to terminals 28, 40, and 41.
[0050] Each terminals 28, 40, and 41 which received the regulation signal change to the control channel of the circumference base stations 20 and 22. This can distribute the traffic which was being concentrated on the base station 21 to the circumference base stations 20 and 22.
[0051] Next, the 3rd operation gestalt is explained with reference to drawing 14 . However, the same sign is given to the part corresponding to each part of the 2nd operation gestalt shown in drawing 13 in the 3rd operation gestalt shown in drawing 14 , and the explanation is omitted.
[0052] The description of the 3rd operation gestalt shown in drawing 14 is having formed control channel ON / OFF section 125 in base stations 20-23. Control channel ON / off section 125 makes off transmission of the control channel signal transmitted from the applicable base station, when a traffic concentration condition is detected by the traffic concentration detecting element 25. Moreover, when it comes to traffic concentration condition un-detecting, it sets to ON again.
[0053] Thus, by suspending transmission of a control channel signal compulsorily, it awaits, the change

of the control channel to other base stations is urged to a terminal, and distribution of traffic is aimed at.
[0054] Next, the 4th operation gestalt is explained with reference to drawing 15 . In the system which (base station CS) 127-132 of a high power mold are connected to the PHS exchange 126, and is constituted, the 4th operation gestalt shown in this drawing 15 forms the group control section 133 and the group control data storage table 134 in the PHS exchange 126, and prepares and constitutes the channel limit exaggerated notice section 141 and the transmitting output-control section 142 in each base stations 127-132 further.
[0055] In the base stations 127-132 of a high power mold, it is a base station with the area 135-140 which covers the range of 1-1.5km radius. Although the range of 1-1.5km radius must be covered by regular 3 message channels (three channels) in one base station, since traffic is not well sold for three channels, the base station has been densely installed so that two or more area may overlap.
[0056] Moreover, since a control channel interferes, there is and it becomes impossible to transmit to a terminal normally when such installation is performed, it is constituted so that the synchronization between base stations may be taken and interference may be prevented.
[0057] The group control section 133 carries out the maximum transmitting output control which performs the directions which make one group three or more base stations with which area laps mutually, make max control channel level of one base station in each group, and are made into this max so that the area of the base station a contiguity group's maximum transmitting output may not adjoin. Moreover, the maximum transmitting output directions are performed to the base station which has an opening in a message channel.
[0058] The group control data referred to in order to perform the maximum transmitting output control are stored in the table 134. In order to perform the maximum transmitting output control, group control data show the sequence of the base station which makes a transmitting output max, while showing in which group a base station exists.
[0059] The channel limit exaggerated notice section 141 notifies that all of three channels of a convention were buried in one area to the group control section 133. The transmitting output-control section 142 controls the strength of the level of a control channel signal, and it performs control which makes control channel signal level max according to the maximum transmitting output directions from the group control section 133 while it lowers control channel signal level, when all of three channels of a convention are buried.
[0060] In such a configuration, the 4th - the 6th base station 130-132 where the 1st - the 3rd base station 127-129 adjoin the 1st group and this are made with the 2nd group, and suppose at present that the transmitting output of the 2nd base station 128 and the 5th base station 131 is made with max.
[0061] Here, supposing three terminals which are not illustrated in area 136 talk over the telephone, the channel limit exaggerated notice section 141 will notify that all of three channels of a convention were buried to the group control section 133. At this time, the transmitting output-control section 142 of the 2nd base station 128 lowers control channel level.
[0062] By referring to a table 134, the group control section 133 which received this notice performs the directions which make max control channel level of the 1st base station 127 which has an opening in a message channel while forming the area 135 which does not adjoin the area 139 of the 5th base station 131. According to these directions, the transmitting output-control section 142 of the 1st base station 127 makes control channel level max.
[0063] The maximum transmitting output control will be performed in the 1st and 2nd groups similarly hereafter, and distribution of traffic will be performed by this. Moreover, the regulation signal transmitting section 123 shown in drawing 13 explained with the 2nd operation gestalt instead of the transmitting output-control section 142 may be formed.
[0064] In this case, when it is detected that all of three channels of a convention were buried with the channel limit exaggerated notice section 141, the regulation signal transmitting section 123 awaits the regulation signal with which use of an applicable base station tells that current is impossible, and it transmits to a terminal.
[0065] Furthermore, control channel ON / OFF section 125 shown in drawing 14 explained with the 3rd

operation gestalt instead of the transmitting output-control section 142 may be formed. In this case, when it is detected that all of three channels of a convention were buried with the channel limit exaggerated notice section 141, control channel ON / off section 125 makes off transmission of the control channel signal transmitted from the applicable base station.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the principle Fig. of this invention.
[Drawing 2] It is drawing for explaining the traffic load distribution method in PHS of the 1st operation gestalt of this invention.
[Drawing 3] It is drawing showing the description element of the base station of the 1st operation gestalt shown in drawing 2 .
[Drawing 4] It is the 1st traffic intensive detection block diagram.
[Drawing 5] It is the 1st traffic intensive detection actuation explanation sequence diagram.
[Drawing 6] It is the 2nd traffic intensive detection block diagram.
[Drawing 7] It is the 2nd traffic intensive detection actuation explanation sequence diagram.
[Drawing 8] It is a location registration area (general calling area) explanatory view.
[Drawing 9] It is the 3rd traffic intensive detection explanatory view.
[Drawing 10] It is the 3rd traffic intensive detection block diagram.
[Drawing 11] It is a general calling area changed-number processing explanatory view.
[Drawing 12] It is the 3rd traffic intensive detection actuation explanation sequence diagram.
[Drawing 13] It is the block block diagram of the base station by the traffic load distribution method in PHS of the 2nd operation gestalt of this invention.
[Drawing 14] It is the block block diagram of the base station by the traffic load distribution method in PHS of the 3rd operation gestalt of this invention.
[Drawing 15] It is a system configuration Fig. by the traffic load distribution method in PHS of the 4th operation gestalt of this invention.
[Drawing 16] It is the system configuration Fig. of PHS.
[Drawing 17] It is drawing for explaining the conventional trouble.
[Description of Notations]
20 21 Base station
25 Traffic Intensive Detection Means
26 Transmitting Output-Control Means
27 28 Message area of base stations 20 and 21
33 Message Area Formed when Control Channel Level is Raised
34 Message Area Formed when Control Channel Level is Lowered
36-41 Terminal

[Translation done.]

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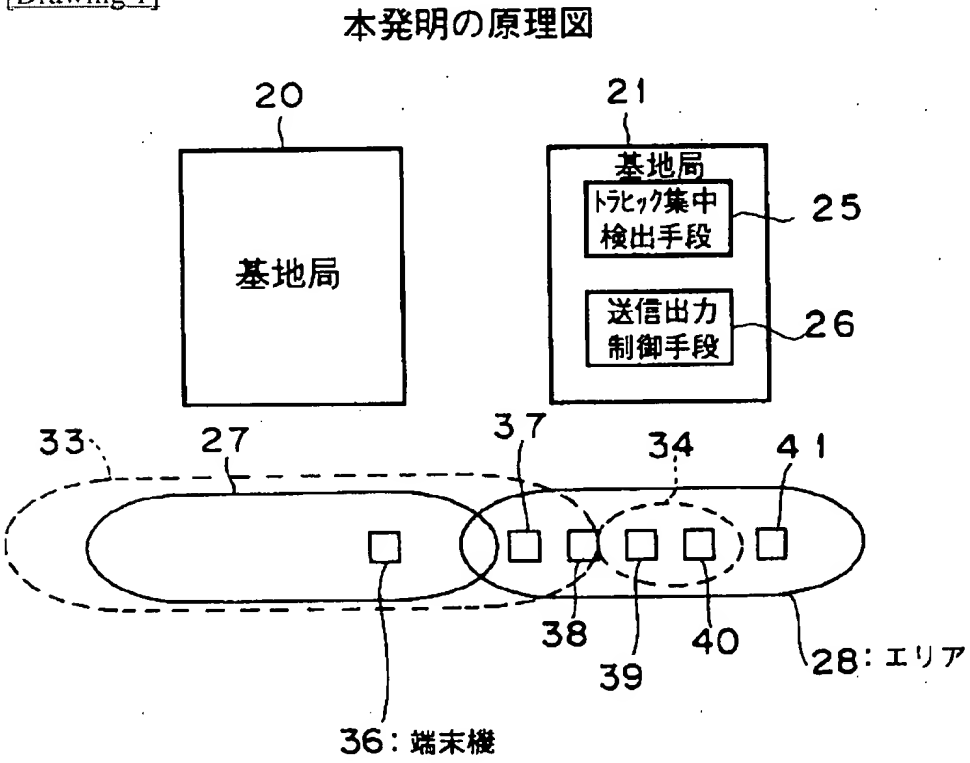
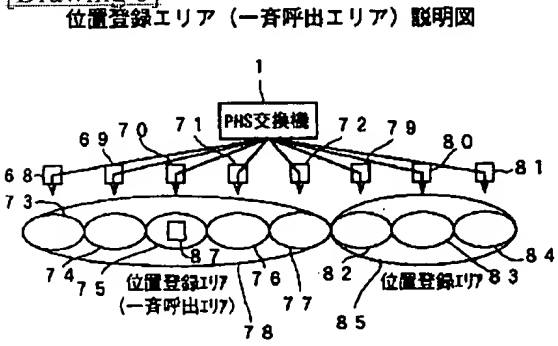
DRAWINGS

[Drawing 1]

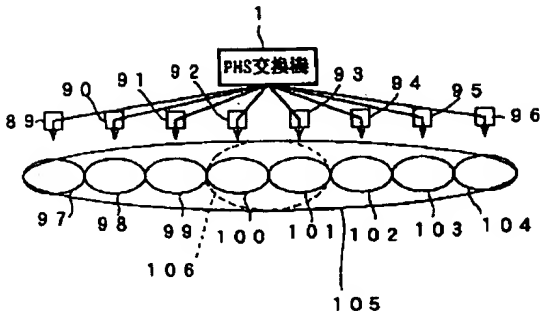


[Drawing 8]



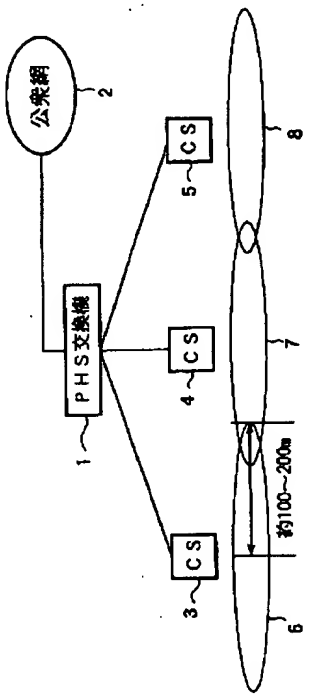
[Drawing 9]

第３のトラヒック集中検出説明図



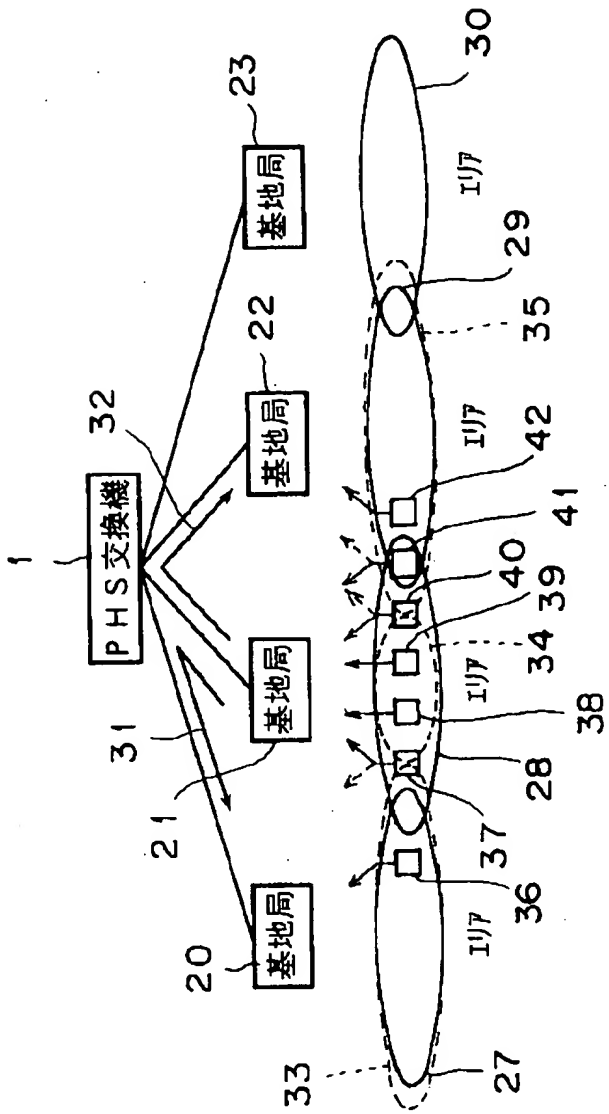
[Drawing 16]

ＰＨＳのシステム構成図

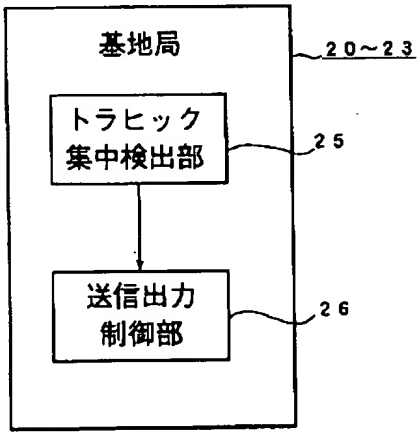


[Drawing 2]

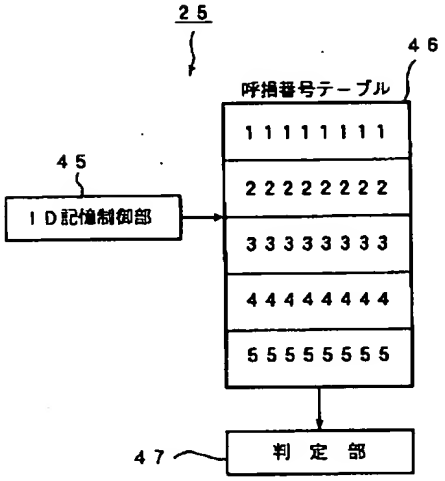
第１実施形態図



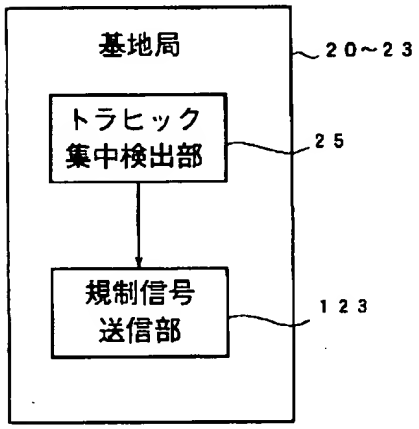
[Drawing 3]
図２に示す基地局の特徴要素を示す図



[Drawing 4]
第１のトラヒック集中検出構成図

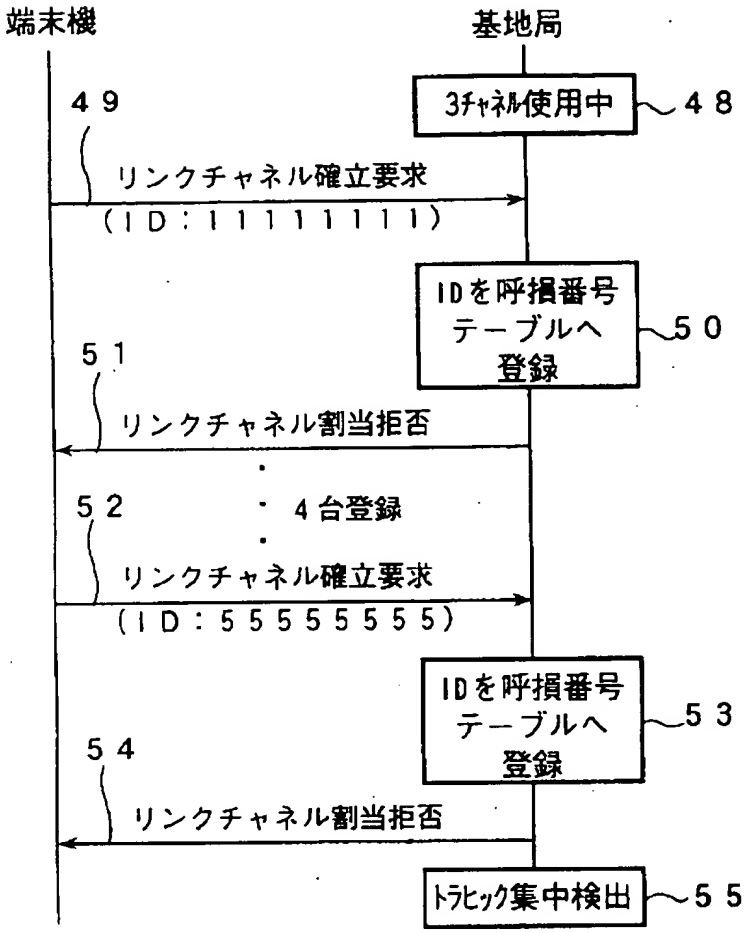


[Drawing 13]
第２実施形態図



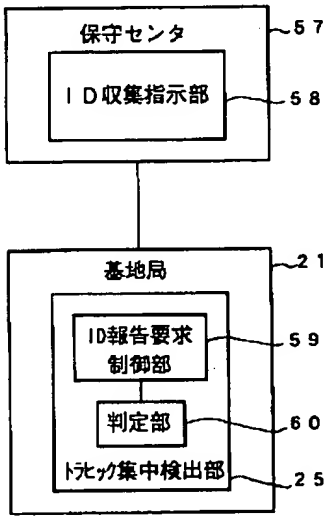
[Drawing 5]

第１のトラヒック集中検出動作説明シーケンス図



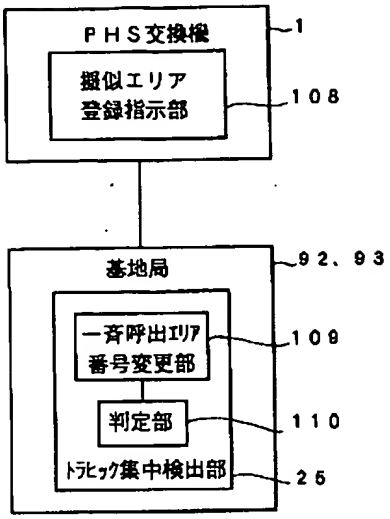
[Drawing 6]

第２のトラヒック集中検出構成図



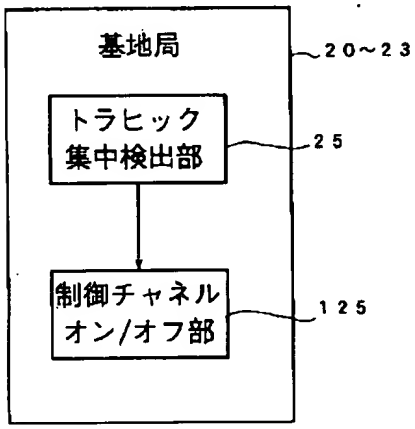
[Drawing 10]

第３のトラヒック集中検出構成図



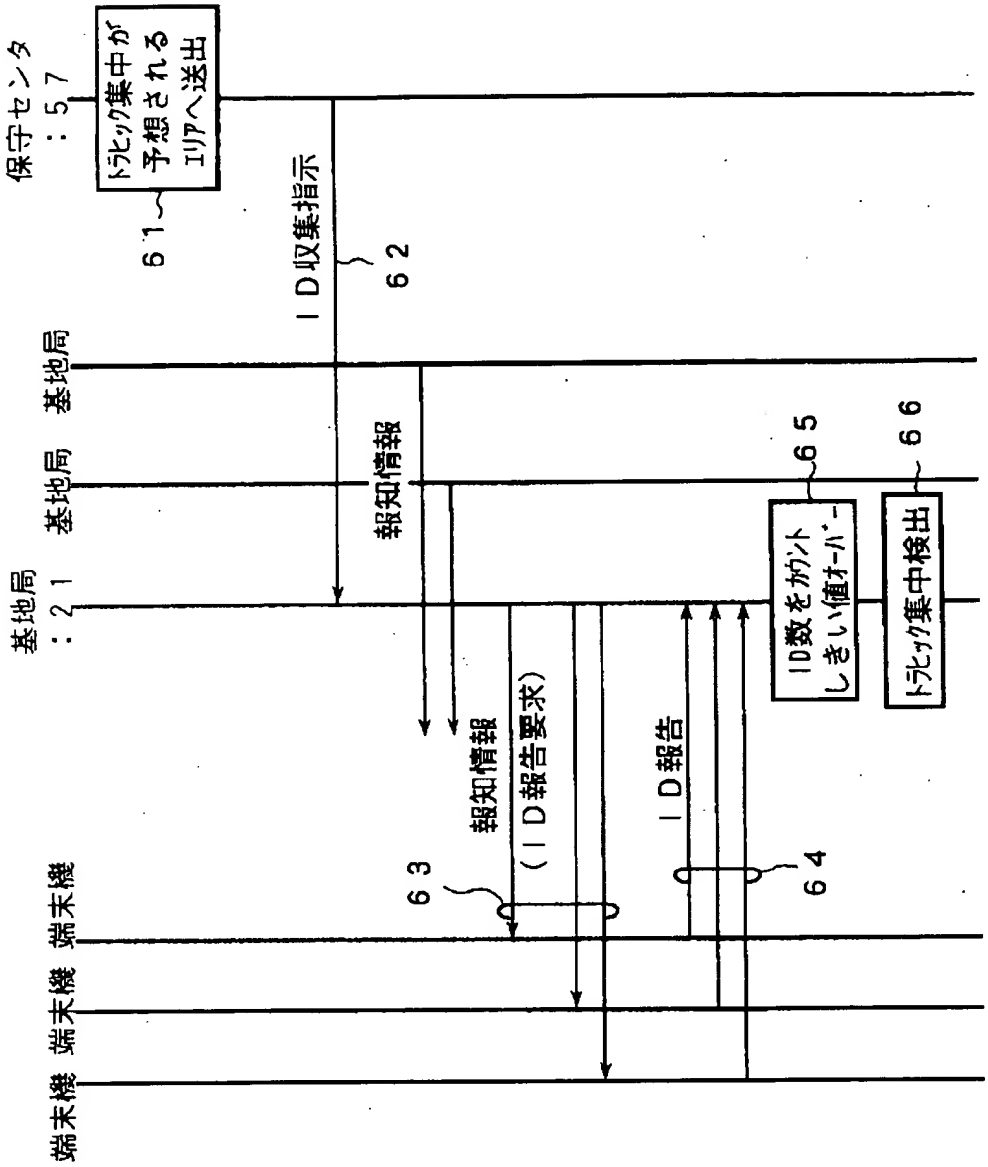
[Drawing 14]

第３実施形態図



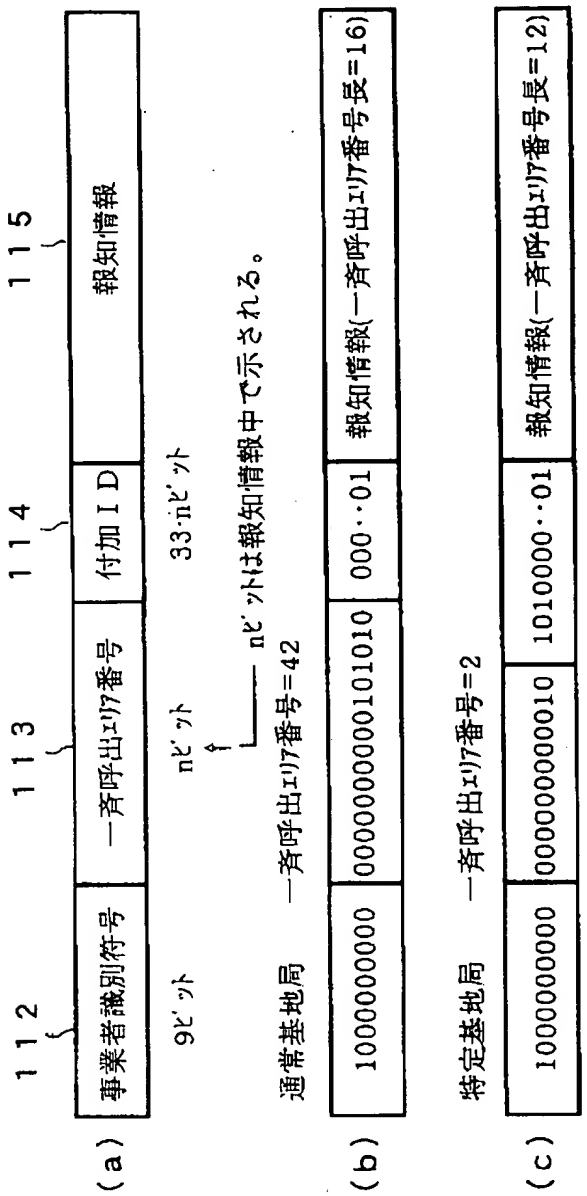
[Drawing 7]

第２のトラヒック集中検出動作説明シーケンス図



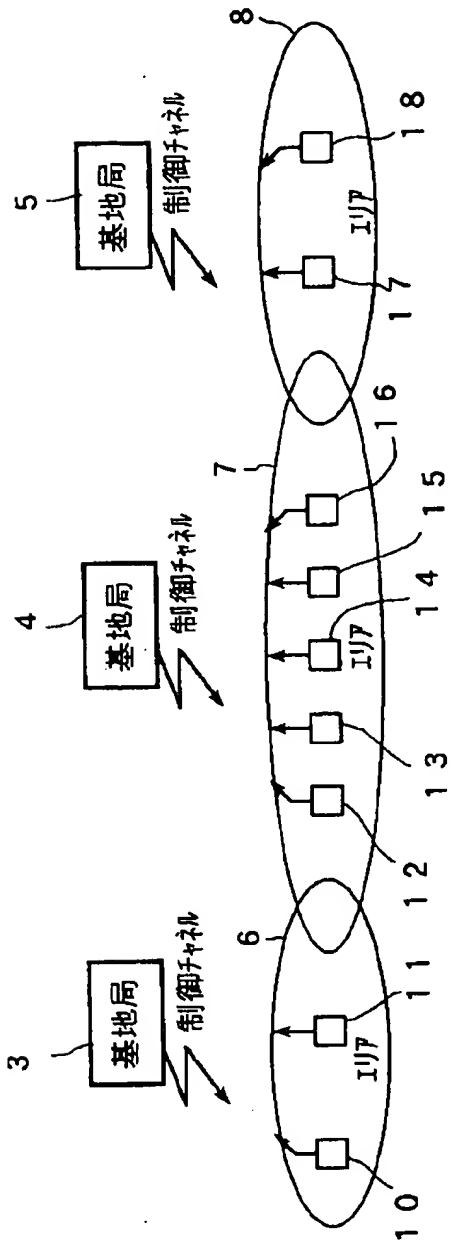
[Drawing 11]

一斉呼出エリア番号変更処理説明図



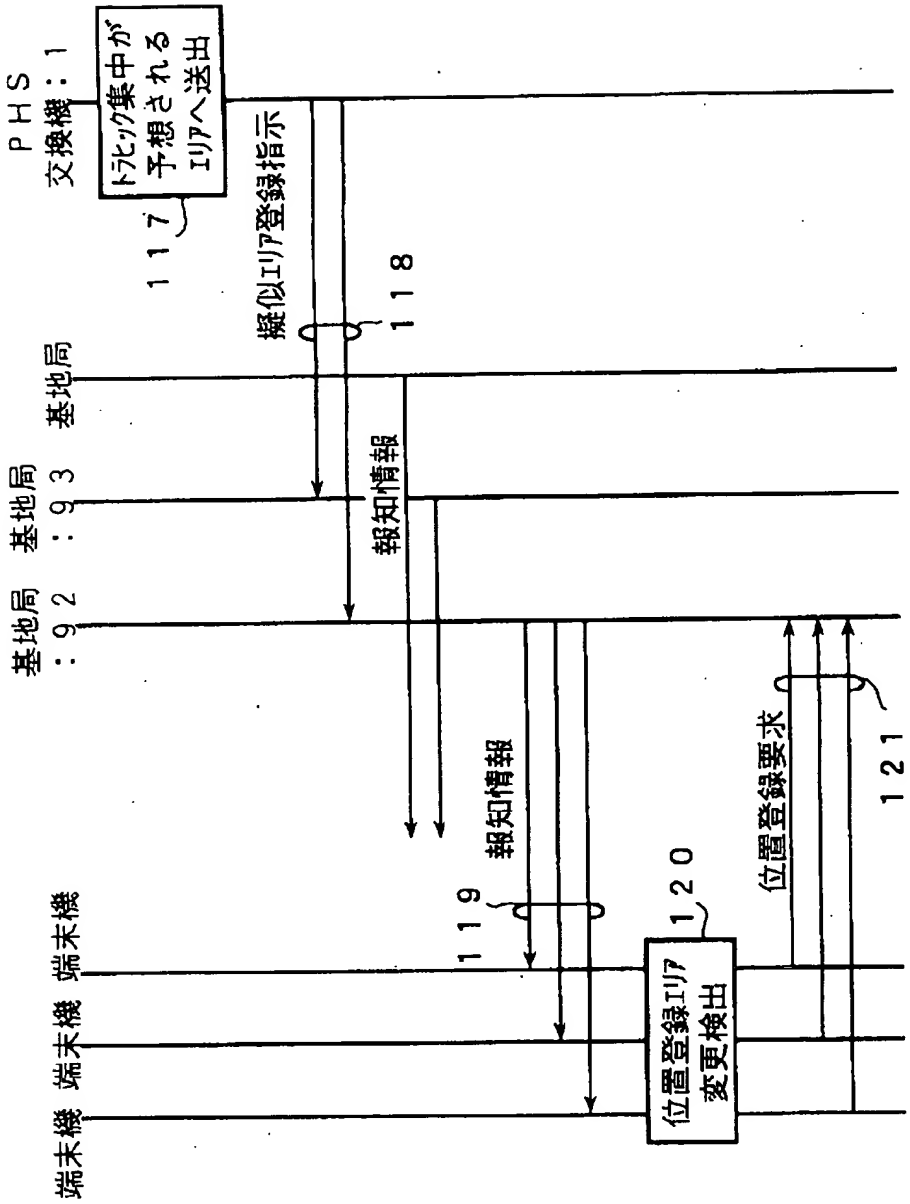
[Drawing 17]

従来問題点説明図



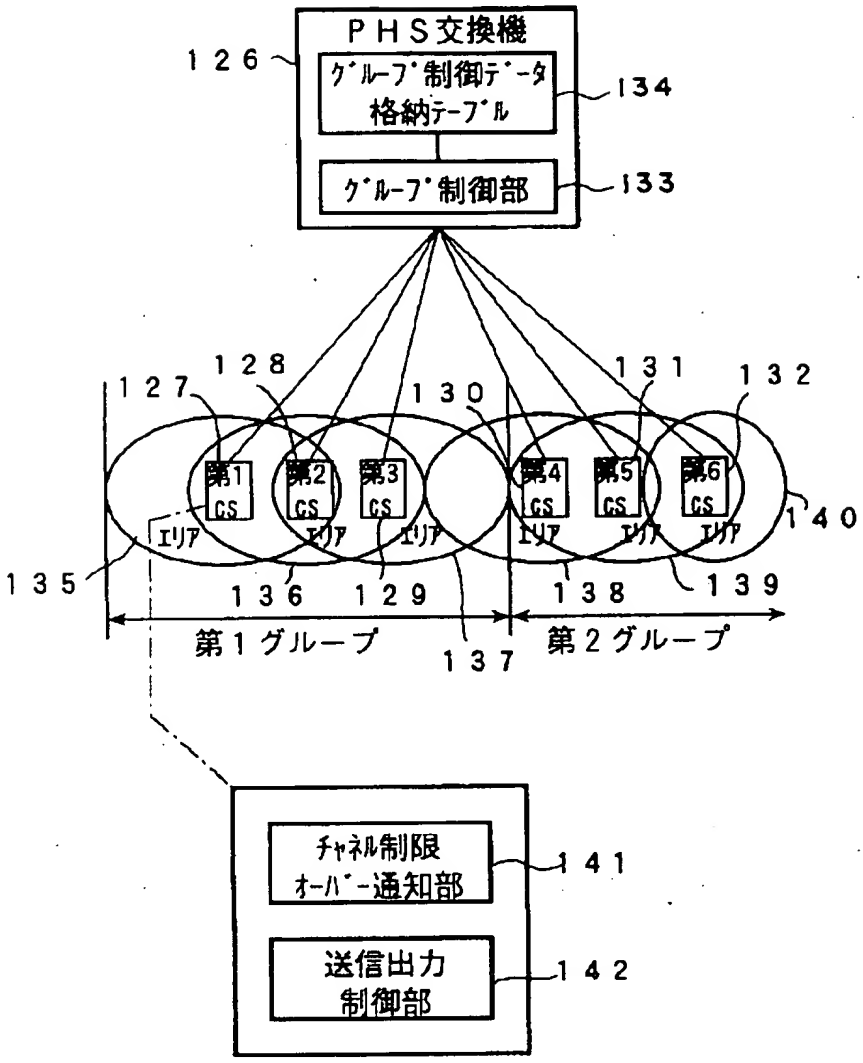
[Drawing 12]

第３のトラヒック検出動作説明シーケンス図



[Drawing 15]

第４実施形態図



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(71) Applicant: **FUJITSU LTD**

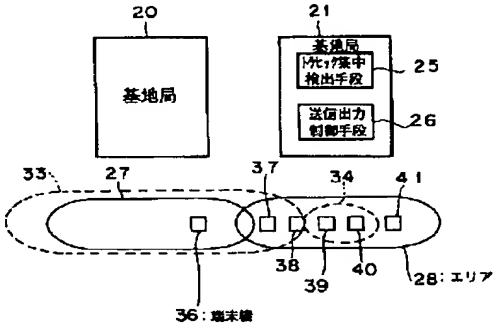
(72) Inventor: **MATSUMURA GAKUO**

(54) TRAFFIC LOAD DISTRIBUTING METHOD FOR MOBILE COMMUNICATION SYSTEM

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a traffic load distributing method for mobile communication system by which the traffic concentrated at a specified base station can be distributed to other base stations.

SOLUTION: Base stations 20 and 21 are provided with a means 25 for detecting the state of concentrated traffic exceeding a specified speech enable channel caused by the concentration of terminal equipment 37-41 into a formed speech area 28 of present base station 21 and control means 26 for decreasing the control channel signal level of present base station 21 at the time of that detection, instructing the increase of signal level to peripheral base stations 20 and increasing the signal level corresponding to the instructions from the peripheral base stations 20. Then, the speech area is reduced as shown by 34 by lowering the signal level of base station 21 in the state of concentrating traffic, and the speech area is extended as shown by 33 increasing the level of peripheral base stations 20. Thus, the terminal equipment 37 and 38, which receive the control channel signal of base station 21 up to the moment, can enter the speech area 33 to receive the signal of base station 20.



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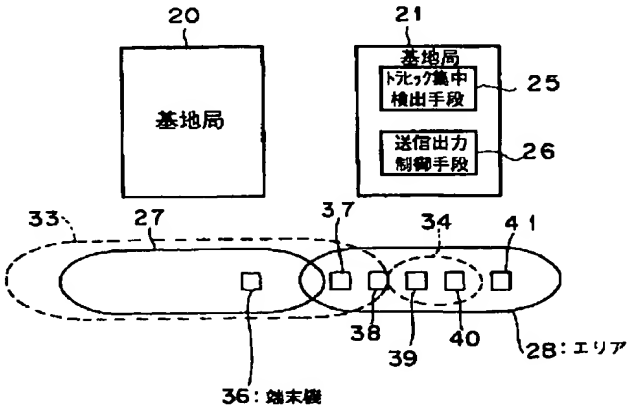
(54)【発明の名称】　移動通信システムにおけるトラヒック負荷分散方式

(57)【要約】

【課題】本発明は特定基地局に集中したトラヒックを他の基地局に分散させることができる移動通信システムにおけるトラヒック負荷分散方式を提供することを目的とする。

【解決手段】自基地局２１の形成通話エリア２８に端末機３７～４１が集中することによる規定通話可能チャネルを越えるトラヒック集中状態を検出する手段２５と、その検出時に自基地局２１の制御チャネル信号レベルを下げると共に周辺基地局２０に信号レベルを上げる指示を行い、また周辺基地局２０からの指示に応じて信号レベルを上げる制御手段２６とを基地局２０，２１に具備し、トラヒック集中状態の基地局２１の信号レベルを下げて３４で示すように通話エリアを縮小し、周辺基地局２０のレベルを上げて３３で示すように通話エリアを拡大し、今まで基地局２１の制御チャネル信号を受信していた端末機３７，３８が通話エリア３３に入って基地局２０の信号を受信するように構成する。

本発明の原理図



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【特許請求の範囲】

【請求項１】　１つの基地局に集中したトラヒックを他の基地局に分散する移動通信システムにおけるトラヒック負荷分散方式であって、

自基地局が形成する通話エリアに端末機が集中することによる規定通話可能チャネルを越えるトラヒック集中状態を検出するトラヒック集中検出手段と、

該トラヒック集中状態検出時に該自基地局の制御チャネル信号レベルを下げると共に、周辺基地局に制御チャネル信号レベルを上げる指示を行い、また周辺基地局からの該指示に応じて該制御チャネル信号レベルを上げる制御を行う送信出力制御手段とを基地局に具備し、

前記自基地局の通話エリア内における前記周辺基地局の通話エリア近辺の端末機が、該周辺基地局の通話エリア内に入るように、前記制御チャネル信号レベルの上げ下げが行われることを特徴とする移動通信システムにおけるトラヒック負荷分散方式。

【請求項２】　前記送信出力制御手段の代わりに、前記トラヒック集中状態が検出された際に該当基地局の利用が不可能なことを知らせる規制信号を待ち受け端末機へ送信する規制信号送信手段を具備したことを特徴とする請求項１記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項３】　前記送信出力制御手段の代わりに、前記トラヒック集中状態が検出された際に送信中の制御チャネル信号を停止する制御チャネルオン／オフ手段を具備したことを特徴とする請求項１記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項４】　前記トラヒック集中検出手段を、前記端末機の固有番号が記憶されるテーブルと、該テーブルに呼損発生端末機の固有番号を同じものが重ならないように記憶する記憶制御手段と、該テーブルに記憶された固有番号の数が設定時間内に設定閾値を越えた際に前記トラヒック集中状態と判定する判定手段とを具備して構成したことを特徴とする請求項１～３の何れかに記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項５】　前記基地局が接続された交換局に、該基地局に前記固有番号の収集指示を行う収集指示手段を設け、前記トラヒック集中検出手段を、該収集指示に応じて端末機に固有番号の報告要求を報知情報にのせて送信する報告要求制御手段と、該報告要求に応じて報告されてきた固有番号数をカウントし、このカウント数が設定時間内に設定閾値を越えた場合にトラヒック集中状態と判定する判定手段とを具備して構成したことを特徴とする請求項１～３の何れかに記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項６】　前記基地局が接続された交換局に、一斉呼出エリア内の任意エリアを擬似エリアとする登録指示を行う登録指示手段を設け、前記トラヒック集中検出手段を、該登録指示に応じて一斉呼出エリア番号と異なる

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擬似一斉呼出エリア番号に変更する変更手段と、該擬似一斉呼出エリア番号を受信した端末機からの位置登録要求数をカウントし、このカウント数が設定時間内に設定閾値を越えた場合にトラヒック集中状態と判定する判定手段とを具備して構成したことを特徴とする請求項１～３の何れかに記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項７】　前記変更手段が、前記一斉呼出エリア番号のビット長を変更することによって前記擬似一斉呼出エリア番号に変更することを特徴とする請求項６記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項８】　交換局に広い通話エリアを形成する高出力型の基地局が接続された移動通信システムにおけるトラヒック負荷分散方式であって、

互いにエリアが重なる複数の基地局を１つのグループとし、各グループ内の１つの基地局の制御チャネルレベルを最大とする指示を隣接グループの制御チャネルレベルが最大とされている基地局のエリアが隣接しないように通話チャネルに空きがある基地局に対して行うグループ制御手段を交換局に具備し、

１つのエリアで規定数の通話チャネルが全て埋まったことを該グループ制御手段へ通知するチャネル制限オーバー通知手段と、

該通話チャネルが全て埋まった際に制御チャネル信号レベルを下げると共に、グループ制御手段からの該制御チャネルレベルを最大とする指示に応じて該制御チャネル信号レベルを最大とする送信出力制御手段とを基地局に具備したことを特徴とする移動通信システムにおけるトラヒック負荷分散方式。

【請求項９】　前記送信出力制御手段の代わりに、前記通話チャネルが全て埋まった際に該当基地局の利用が不可能なことを知らせる規制信号を待ち受け端末機へ送信する規制信号送信手段を具備したことを特徴とする請求項８記載の移動通信システムにおけるトラヒック負荷分散方式。

【請求項１０】　前記送信出力制御手段の代わりに、前記通話チャネルが全て埋まった際に、送信中の制御チャネル信号を停止する制御チャネルオン／オフ手段を具備したことを特徴とする請求項８記載の移動通信システムにおけるトラヒック負荷分散方式。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は移動通信システムにおけるトラヒック負荷分散方式に関する。この移動通信システムにおけるトラヒック負荷分散方式は、特にパーソナルハンディホンシステム（ＰＨＳ）に適用されるものである。ＰＨＳは、法的基準によって１基地局当たりの通話チャネルが３チャネルと規制されており、人が多数集まる地域では通話不可能なケースが発生する。そこでそのような地域で通話をカバーできる方式が要望され

ている。

【０００２】

【従来の技術】図１６にＰＨＳのシステム構成図を示し、その説明を行う。この図に示す符号１は公衆網２に接続されたＰＨＳ交換機である。３，４，５はＰＨＳ交換機１に有線接続された複数の基地局（ＣＳ）であり、各々がその送信電波によって約１００～２００ｍの通話エリア６，７，８を形成している。

【０００３】図示せぬ移動電話機（以降、端末機と呼ぶ）は、その通話エリア６，７，８の何れかに在って、各基地局３～５から送信されている最も高いレベルの制御チャネル信号を選択し、この選択基地局（３～５の何れか）を介して発信／着信を行うことによって相手と通話を行うようになっている。

【０００４】

【発明が解決しようとする課題】ところで、上述したＰＨＳにおいては、１基地局当たりの通話チャネルが３チャネルと少なく、人が多数集まる地域ではトラヒックが集中し、通話不可能なケースが発生する問題があった。

【０００５】例えば、図１６の各エリア６～８に端末機１０～１８を記入した図１７において、エリア７に存在する３つの端末機１２，１３，１４が第２基地局４を介して発信／着信を行うと、同じエリア７に存在する他の２つの基地局１５，１６は発信／着信が行えなくなる。

【０００６】他の端末機１５，１６が他の基地局３，５を介して発信／着信を行うにはそのエリア６，８方向に移動し、基地局４の制御チャネル信号のレベルよりも基地局３又は５のレベルが高くなるポイントまで移動し、基地局３又は５の制御チャネル信号を選択する必要がある。

【０００７】通常の場合、端末機１０～１８を保持する人は歩き回っているので、特定エリアに集中することが少ないのでトラヒックは分散され、上述した問題はあまり生じない。しかし、競技場や劇場では特定エリアに移動を伴わない端末機が集中し、これによって特定の基地局にトラヒックが集中することになり、上述した問題が生じることになる。

【０００８】本発明は、このような点に鑑みてなされたものであり、特定基地局に集中したトラヒックを他の基地局に分散させることができる移動通信システムにおけるトラヒック負荷分散方式を提供することを目的としている。

【０００９】

【課題を解決するための手段】図１に本発明の原理図を示す。この図に示す移動通信システムにおけるトラヒック負荷分散方式は、１つの基地局に集中したトラヒックを他の基地局に分散するものであり、本発明の特徴は、自基地局２１が形成する通話エリア２８に端末機３７，３８，３９，４０，４１が集中することによる規定通話可能チャネルを越えるトラヒック集中状態を検出するトラヒック集中検出手段２５と、トラヒック集中状態検出時に自基地局２１の制御チャネル信号レベルを下げると共に、周辺基地局２０に制御チャネル信号レベルを上げる指示を行い、また周辺基地局２０からの先の指示に応じて制御チャネル信号レベルを上げる制御を行う送信出力制御手段２６とを基地局２０，２１に具備し、自基地局２１の通話エリア２８内における周辺基地局２０の通話エリア２７近辺の端末機３７，３８が、周辺基地局２０の通話エリア３３内に入るように、制御チャネル信号レベルの上げ下げが行われるように構成したことにある。

【００１０】つまり、トラヒック集中状態の基地局２１の制御チャネル信号レベルを下げることによって破線の楕円３４で示すように通話エリアを縮小し、周辺基地局２０の制御チャネル信号レベルを上げることによって破線の楕円３３で示すように通話エリアを拡大し、これによって今まで基地局２１の制御チャネル信号を受信していた端末機３７，３８が通話エリア３３に入って基地局２０の制御チャネル信号を受信するようになる。

【００１１】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態について説明する。図２は本発明の第１実施形態のＰＨＳにおけるトラヒック負荷分散方式を説明するための図である。但し、この図２においては図１６に示した公衆網２を省略した。

【００１２】図２において、符号２０，２１，２２，２３は複数の基地局であり、図３に示すように、本発明の特徴要素であるトラヒック集中検出部２５と送信出力制御部２６とを具備して構成されている。

【００１３】トラヒック集中検出部２５は、基地局が形成する１つの通話エリアに端末機が集中することによって特定の基地局に、規定通話可能チャネル（３チャネル）を越える所定数のトラヒックが集中したことを検出するものである。

【００１４】送信出力制御部２５は、制御チャネル信号のレベルの強弱を制御をするものであり、トラヒック集中状態を検出した基地局の制御チャネル信号レベルを下げると共に、その周辺基地局に制御チャネル信号レベルを上げるように指示（送信出力増加指示）し、また、他の基地局からの送信出力増加指示に応じて制御チャネル信号レベルを上げるように制御するものである。

【００１５】例えば、図２に符号２７，２８，２９，３０で示すように、各基地局２０～２４が同一レベルの制御チャネル信号でエリアを形成している場合に、例えば、符号３６，３７，３８，３９，４０，４１，４２で示す端末機が図示するように所定地域に集中し、これによって、基地局２１が形成するエリア２８に端末機３７～４１が集中したとする。

【００１６】この場合に、基地局２１のトラヒック集中検出部２５がトラヒック集中状態を検出することによっ

て、自基地局２１の送信出力制御部２６が制御チャネル信号レベルを下げ、また、矢印３１，３２で示すように周辺基地局２０，２２に制御チャネル信号レベルを上げるように指示したとする。

【００１７】この指示に応じて、周辺基地局２０，２２の送信出力制御部２６が制御チャネル信号レベルを上げる。以上の制御によって、基地局２１のエリア２８が符号３４で示すエリアのように狭まり、基地局２０，２２のエリア２７，２９が符号３３，３５で示すエリアのように広くなる。

【００１８】そして、レベル制御前のエリア２８に存在した端末機３７～４１の内、待ち受け保持レベルを下回った端末機３７，４０，４１が、レベル上昇によって広がったエリア３３，３５に入れば、そのエリア３３，３５を形成する基地局２０，２２の制御チャネル信号を選択する。

【００１９】これによって、基地局２１に集中していたトラヒックを、周辺基地局２０，２２に分散することができ、通話の行えなかった端末機３７，４０，４１が通話可能状態となる。

【００２０】次に、トラヒック集中検出部２５が上述したトラヒック集中状態の検出を行う第１～第３の発明による方法を説明する。第１の方法は、制御チャネル信号の閉塞により呼が基地局にて切断される呼損が発生した場合、その呼損を実施した基地局が、端末機自体の固有番号である端末機番号（以降、ＩＤと言う）を記憶し、以降、呼損が発生した場合に、同じＩＤは無視し、新たに呼損を生じさせた異なるＩＤを記憶しながらその記憶したＩＤ数をカウントする。そして、そのカウント数が所定時間内に所定の閾値を越えた場合にトラヒック集中状態と判定するものである。

【００２１】即ち、図４に示すように、トラヒック集中検出部２５に、ＩＤ記憶制御部４５と、ＩＤをＩＤ記憶制御部４５の制御によって記憶する呼損番号テーブル４６と、このテーブル４６に記憶されたＩＤの数をカウントし、このカウント数が設定時間内に設定閾値、例えば「４」を越えるとトラヒック集中状態と判定する判定部４７とを設ける。

【００２２】このような構成において、図５に符号４８で示すように３加入者通話状態の基地局に対してＩＤ「11111111」の端末機がリンクチャネル確率要求を行うと、呼損が発生するので、符号５０で示すようにＩＤ記憶制御部４５が呼損番号テーブル４６にそのＩＤ「11111111」を登録する。この際、符号５１で示すようにリンクチャネル割当拒否がＩＤ「11111111」の端末機に対して行われる。

【００２３】これと同様に他の異なるＩＤ「22222222」、「33333333」、「44444444」も登録されたとする。ここで、呼損番号テーブル４６に登録されたＩＤの端末機から何度発信が行われてもＩＤ記憶制御部４５は呼損番号テーブル４６の変更を行わない。

【００２４】次に、符号５２で示すように、ＩＤ「55555555」の端末機からリンクチャネル確率要求が行われた際に、そのＩＤ「55555555」が符号５３で示すように呼損番号テーブル４６に登録され、符号５４で示すようにリンクチャネル割当拒否がＩＤ「11111111」の端末機に対して行われたとする。

【００２５】この場合、判定部４７におけるＩＤのカウント数が設定閾値「４」を越える「５」となるので、トラヒック集中状態と判定され、トラヒック集中状態が検出される。

【００２６】第２の方法を説明する。図６に示すように、基地局２１が接続されたＰＨＳ交換局の保守センタ５７に、基地局２１が端末機のＩＤを収集するように基地局２１に対して指示（ＩＤ収集指示）を行うＩＤ収集指示部５８を設ける。

【００２７】また、基地局に、そのＩＤ収集指示に応じて待ち受け状態の端末機にＩＤ報告要求を報知情報にのせて送信するＩＤ報告要求制御部５９と、ＩＤ報告要求に応じて報告されてきたＩＤ数をカウントし、このカウント数が所定時間内に所定閾値を越えた場合にトラヒック集中状態と判定する判定部６０とを設ける。

【００２８】このような構成において、図７に符号６１で示すように、保守センタ５７のＩＤ収集指示部５８が、トラヒック集中が予想されるエリアを形成する基地局２１へ符号６２で示すＩＤ収集指示を送出する。

【００２９】これによって基地局２１のＩＤ報告要求制御部５９が、符号６３で示すように基地局２１のエリアに存在する待ち受け状態の複数の端末機へ報知情報に乗せてＩＤ報告要求を送信する。

【００３０】この要求に応じて各端末機から送信されてきた符号６４で示すＩＤを、判定部６０がカウントする。このカウント数が符号６５で示すように所定時間内に設定閾値を越えていた場合、符号６６で示すようにトラヒック集中状態と判定することによってトラヒック集中状態を検出する。

【００３１】第３の方法を説明する。この方法は位置登録エリア（一斉呼出エリア）を利用するものである。一斉呼出エリアとは、図８に示す複数の基地局６８～７２又は７９～８１のエリア７３～７７又は８２～８４群を包括する大きいエリア７８又は８５のことであり、図示せぬ公衆網から着信を受けたＰＨＳ交換機１がどの地域を呼び出せばよいかを決定するために設けられているものである。

【００３２】通常、端末機８７は電源をオンにしたときに報知情報の内容から一斉呼出エリア番号を記憶し、基地局７０へ位置登録要求を送信する。これによってＰＨＳ交換機１から端末機８７を呼び出す一斉呼出エリア７８が決定される。

【００３３】この時、端末機８７は一斉呼出エリア７８

内をどこに移動しようとも位置登録要求を行わない。以降、位置登録を行うタイミングは、一斉呼出エリア７８を離れて他の一斉呼出エリア８５に入った時、即ち、報知情報の一斉呼出エリア番号が端末機８７が記憶しているものと異なる時である。

【００３４】同一位置登録エリア７８中の基地局６８～７２から送信される報知情報の一斉呼出エリア番号は全て同じである。このため端末機８７は位置登録要求を行わないようになっている。

【００３５】そこで、第３の方法は、図９に示すように、端末機８９～９６のエリア９７～１０４群によって形成される一斉呼出エリア１０５にあって、端末機が集中しそうなエリア１００，１０１を疑似的に他の一斉呼出エリア（以降、擬似エリアといい、符号１０６で示す）に見せかけ、端末機がその擬似エリア１０６へ移動した場合に、位置登録要求を送信させ、この送信位置登録要求の数が所定時間内に設定閾値を越えた場合にトラヒック集中状態と判定するようにする。

【００３６】この方法を実現するために図１０に示すように、ＰＨＳ交換機１に擬似エリア登録指示部１０８を設け、基地局９２，９３のトラヒック集中検出部２５に一斉呼出エリア番号変更部１０９及び判定部１１０を設けて構成する。

【００３７】擬似エリア登録指示部１０８は、図９に示したように、擬似エリア１０６としたいエリア１００，１０１を形成する基地局９２，９３に擬似エリア登録指示を行うものである。

【００３８】一斉呼出エリア番号変更部１０９は、擬似エリア登録指示に応じて一斉呼出エリア番号を変更するものである。この変更処理を図１１を参照して説明する。一斉呼出エリア番号変更処理は、該当基地局からの報知情報中の一斉呼出エリア番号長を変更するものである。

【００３９】図１１（ａ）に示すように、端末機への送信報知情報の構成は、１１２で示す９ビットの事業者識別符号、１１３で示すｎビットの一斉呼出エリア番号、１１４で示す３３－ｎビットの付加ＩＤ、１１５で示す報知情報となっており、一斉呼出エリア番号長のｎビットは、報知情報１１５中に示されている。

【００４０】例えば（ｂ）に示すように、報知情報中に一斉呼出エリア番号長＝１６ビットが示されており、一斉呼出エリア番号が「0000000000101010：２進数」＝「４２：１０進数」であったとする。通常であればその一斉呼出エリア番号の「４２」が通知される。

【００４１】しかし、そのエリアを擬似エリアとしたい特定基地局においては、一斉呼出エリア番号変更部１０９によって、例えば、（ｃ）に示すように、報知情報中の一斉呼出エリア番号長を１２ビットに変更する。これによって、一斉呼出エリア番号が「000000000010：２進数」＝「２：１０進数」となる。

【００４２】判定部１１０は、端末機が擬似エリア１０６に入ることによって送信してきた位置登録要求の数が所定時間内に設定閾値を越えた場合にトラヒック集中状態と判定するものである。

【００４３】このような構成において、図１２に符号６１で示すように、ＰＨＳ交換機１の擬似エリア登録指示部１０８が、トラヒック集中が予想されるエリアを形成する基地局９２，９３へ符号１１８で示す擬似エリア登録指示を送出する。

【００４４】この指示に応じて基地局９２，９３の一斉呼出エリア番号変更部１０９が一斉呼出エリア番号の変更を行う。この変更された一斉呼出エリア番号が報知情報に乗せられ端末機へ送信されるが、この際、符号１１９で示す基地局９２の報知情報を、擬似エリアに入った複数の端末機が受信したとする。

【００４５】この場合、各端末機は符号１２０で示すように位置登録エリア（一斉呼出エリア）の変更を検出し、符号１２１で示すように基地局９２へ位置登録要求を行うことによって一斉呼出エリア番号の「２」を新たに記憶する。

【００４６】また、基地局９２の判定部１１０は、位置登録要求の数をカウントし、このカウント数が所定時間内に設定閾値を越えた場合、トラヒック集中状態と判定することによってトラヒック集中状態を検出する。

【００４７】次に、第２実施形態を図１３を参照して説明する。但し、図１３に示す第２実施形態において図２及び図３に示した第１実施形態の各部に対応する部分には同一符号を付し、その説明を省略する。

【００４８】図１３に示す第２実施形態の特徴は、規制信号送信部１２３を基地局２０～２３に設けたことである。規制信号送信部１２３は、トラヒック集中検出部２５によってトラヒック集中状態が検出された際に、該当基地局の利用が現在不可能なことを知らせる規制信号を、待ち受け端末機へ送信するものである。

【００４９】例えば、図２に示す基地局２１において、トラヒック集中状態が検出されたとすると、規制信号送信部１２３が該当基地局２１の利用が現在不可能なことを知らせる規制信号を、待ち受け端末機２８，４０，４１へ送信する。

【００５０】規制信号を受信した各端末機２８，４０，４１は、周辺基地局２０，２２の制御チャネルに切替えを行う。これによって、基地局２１に集中していたトラヒックを周辺基地局２０，２２に分散することができる。

【００５１】次に、第３実施形態を図１４を参照して説明する。但し、図１４に示す第３実施形態において図１３に示した第２実施形態の各部に対応する部分には同一符号を付し、その説明を省略する。

【００５２】図１４に示す第３実施形態の特徴は、制御チャネルオン／オフ部１２５を基地局２０～２３に設け

たことである。制御チャネルオン／オフ部１２５は、トラヒック集中検出部２５によってトラヒック集中状態が検出された際に、該当基地局から送信されている制御チャネル信号の送信をオフとするものである。またトラヒック集中状態未検出となると再びオンとする。

【００５３】このように制御チャネル信号の送信を強制的に停止することによって、待ち受け端末機へ他の基地局への制御チャネルの切替えを促し、トラヒックの分散を図る。

【００５４】次に、第４実施形態を図１５を参照して説明する。この図１５に示す第４実施形態は、ＰＨＳ交換機１２６に高出力型の基地局（ＣＳ）１２７～１３２が接続されて構成されるシステムにおいて、ＰＨＳ交換機１２６にグループ制御部１３３及びグループ制御データ格納テーブル１３４を設け、更に各基地局１２７～１３２にチャネル制限オーバー通知部１４１及び送信出力制御部１４２を設けて構成したものである。

【００５５】高出力型の基地局１２７～１３２とは、半径１～１．５ｋｍの範囲をカバーするエリア１３５～１４０を持つ基地局である。１つの基地局で半径１～１．５ｋｍの範囲を規定の３通話チャネル（３チャネル）でカバーしなければならないが、３チャネルではトラヒックをさばけないので複数のエリアがオーバーラップするように基地局を密に設置してある。

【００５６】また、このような設置を行うと制御チャネルが干渉しあって端末機へ正常に送信することができなくなるので、基地局間の同期をとって干渉を防止するように構成されている。

【００５７】グループ制御部１３３は、互いにエリアが重なる３つ以上の基地局を１つのグループとし、各グループ内の１つの基地局の制御チャネルレベルを最大とし、この最大とする指示を隣接グループの最大送信出力の基地局のエリアが隣接しないように行う最大送信出力制御を実施するものである。また、最大送信出力指示は通話チャネルに空きがある基地局に対して行われる。

【００５８】その最大送信出力制御を行うために参照するグループ制御データがテーブル１３４に格納されている。グループ制御データは、基地局がどのグループに存在するかを示すと共に、最大送信出力制御を行うために送信出力を最大とする基地局の順番を示すものである。

【００５９】チャネル制限オーバー通知部１４１は、１つのエリアで規定の３チャネルが全て埋まったことをグループ制御部１３３へ通知するものである。送信出力制御部１４２は、制御チャネル信号のレベルの強弱を制御をするものであり、規定の３チャネルが全て埋まった際に制御チャネル信号レベルを下げると共に、グループ制御部１３３からの最大送信出力指示に応じて制御チャネル信号レベルを最大とする制御を行うものである。

【００６０】このような構成において、第１～第３基地局１２７～１２９が第１グループ、これに隣接する第４～第６基地局１３０～１３２が第２グループとなされており、現時点で、第２基地局１２８と第５基地局１３１の送信出力が最大となされているとする。

【００６１】ここで、エリア１３６内に図示せぬ３つの端末機が通話を行ったとすると、チャネル制限オーバー通知部１４１が、規定の３チャネルが全て埋まったことをグループ制御部１３３へ通知する。この時、第２基地局１２８の送信出力制御部１４２が制御チャネルレベルを下げる。

【００６２】この通知を受けたグループ制御部１３３は、テーブル１３４を参照することによって、第５基地局１３１のエリア１３９に隣接しないエリア１３５を形成すると共に通話チャネルに空きのある第１基地局１２７の制御チャネルレベルを最大とする指示を行う。この指示に応じて第１基地局１２７の送信出力制御部１４２が制御チャネルレベルを最大とする。

【００６３】以降同様に第１及び第２グループ内において、最大送信出力制御が行われ、これによってトラヒックの分散が行われることになる。また、送信出力制御部１４２の代わりに、第２実施形態で説明した図１３に示す規制信号送信部１２３を設けてもよい。

【００６４】この場合、チャネル制限オーバー通知部１４１で規定の３チャネルが全て埋まったことが検出された際に、規制信号送信部１２３が該当基地局の利用が現在不可能なことを知らせる規制信号を待ち受け端末機へ送信する。

【００６５】更に、送信出力制御部１４２の代わりに、第３実施形態で説明した図１４に示す制御チャネルオン／オフ部１２５を設けてもよい。この場合、チャネル制限オーバー通知部１４１で規定の３チャネルが全て埋まったことが検出された際に、制御チャネルオン／オフ部１２５が該当基地局から送信されている制御チャネル信号の送信をオフとする。

【００６６】

【発明の効果】以上説明したように、本発明によれば、特定基地局に集中したトラヒックを他の基地局に分散させることができる効果がある。

【図面の簡単な説明】

【図１】本発明の原理図である。

【図２】本発明の第１実施形態のＰＨＳにおけるトラヒック負荷分散方式を説明するための図である。

【図３】図２に示す第１実施形態の基地局の特徴要素を示す図である。

【図４】第１のトラヒック集中検出構成図である。

【図５】第１のトラヒック集中検出動作説明シーケンス図である。

【図６】第２のトラヒック集中検出構成図である。

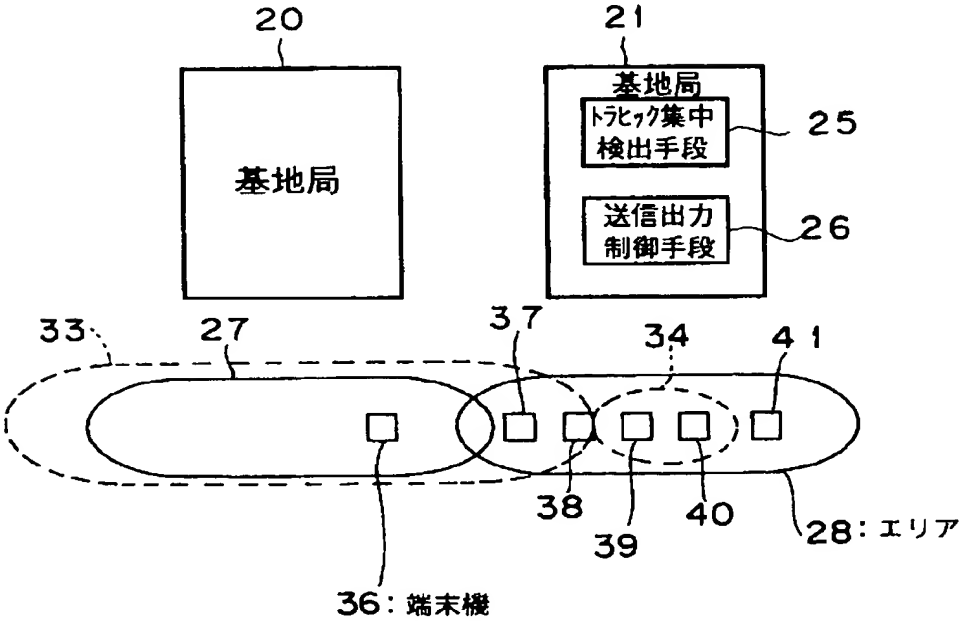
【図７】第２のトラヒック集中検出動作説明シーケンス図である。

【図８】位置登録エリア（一斉呼出エリア）説明図であ

る。
【図９】第３のトラヒック集中検出説明図である。
【図１０】第３のトラヒック集中検出構成図である。
【図１１】一斉呼出エリア番号変更処理説明図である。
【図１２】第３のトラヒック集中検出動作説明シーケンス図である。
【図１３】本発明の第２実施形態のＰＨＳにおけるトラヒック負荷分散方式による基地局のブロック構成図である。
【図１４】本発明の第３実施形態のＰＨＳにおけるトラヒック負荷分散方式による基地局のブロック構成図である。
【図１５】本発明の第４実施形態のＰＨＳにおけるトラヒック負荷分散方式によるシステム構成図である。
【図１６】ＰＨＳのシステム構成図である。
【図１７】従来の問題点を説明するための図である。
【符号の説明】
２０，２１　基地局
２５　トラヒック集中検出手段
２６　送信出力制御手段
２７，２８　基地局２０，２１の通話エリア
３３　制御チャネルレベルを上げた際に形成される通話エリア
３４　制御チャネルレベルを下げた際に形成される通話エリア
３６～４１　端末機

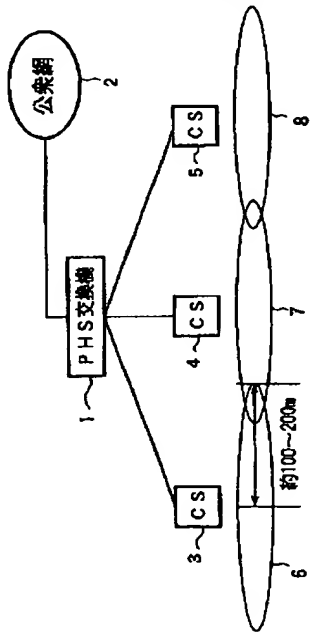
【図１】

本発明の原理図



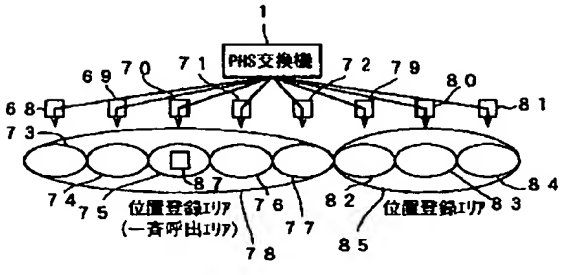
【図１６】

ＰＨＳのシステム構成図



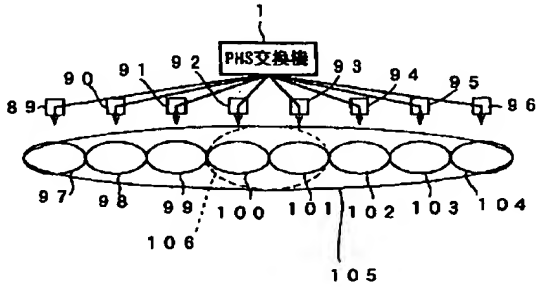
【図８】

位置登録エリア（一斉呼出エリア）説明図



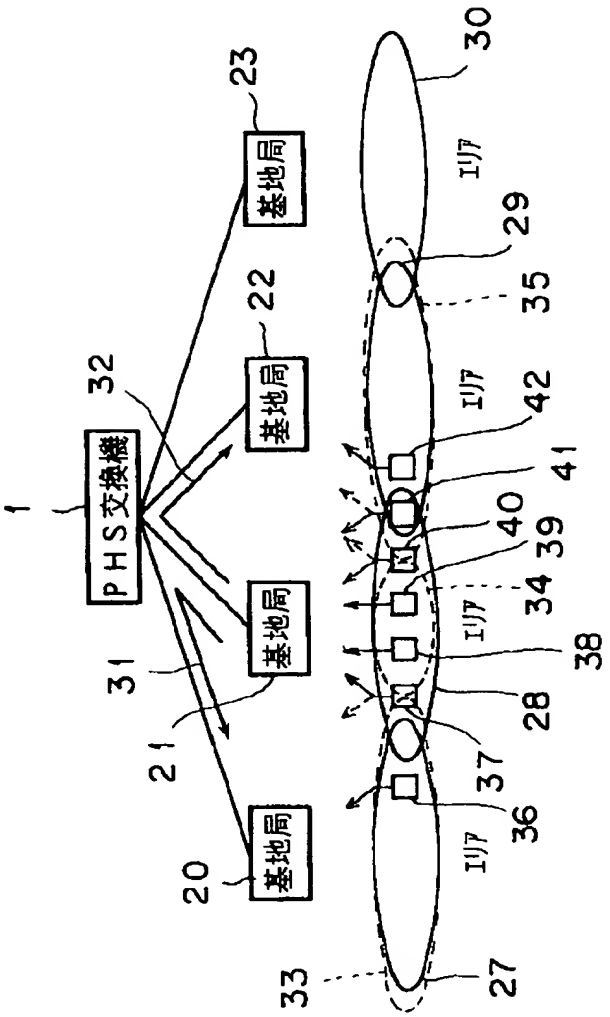
【図９】

第３のトラヒック集中検出説明図



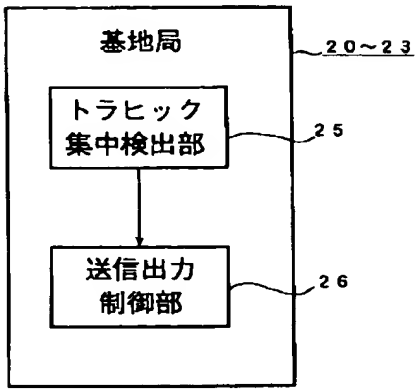
【図２】

第１実施形態図



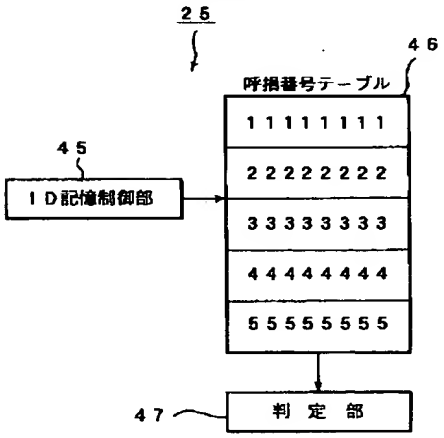
【図３】

図２に示す基地局の特徴要素を示す図



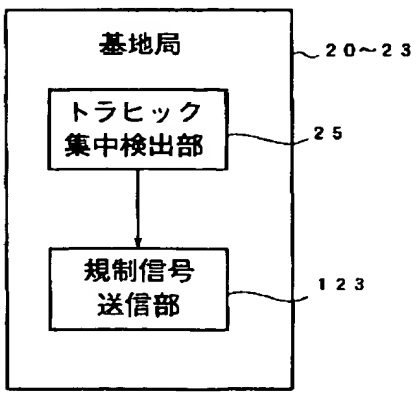
【図４】

第１のトラヒック集中検出構成図



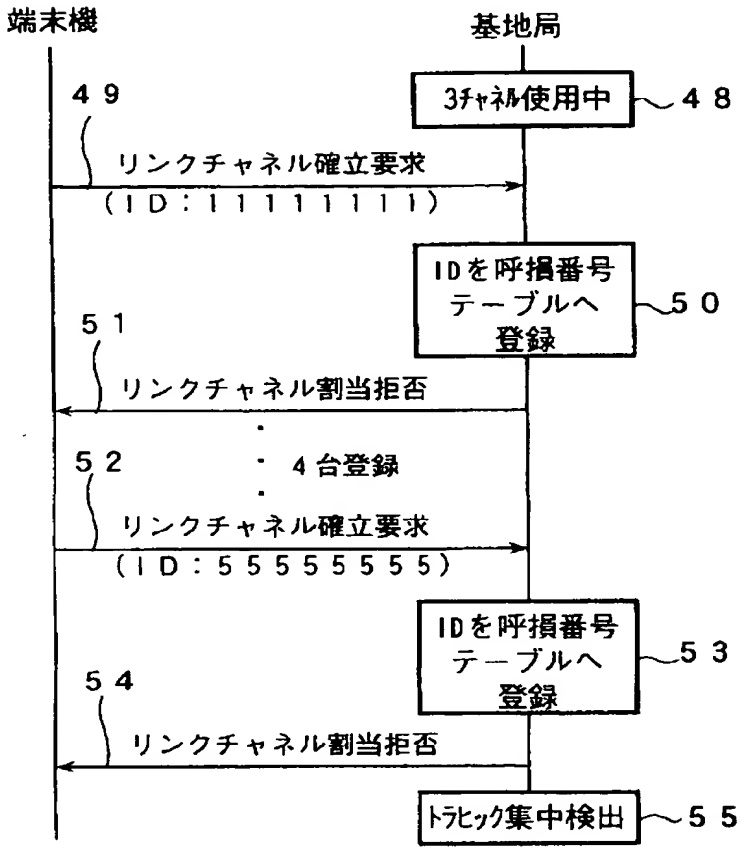
【図１３】

第２実施形態図



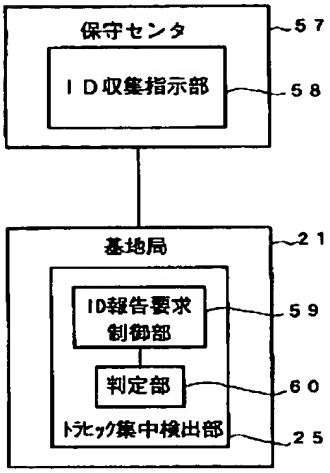
【図５】

第１のトラヒック集中検出動作説明シーケンス図



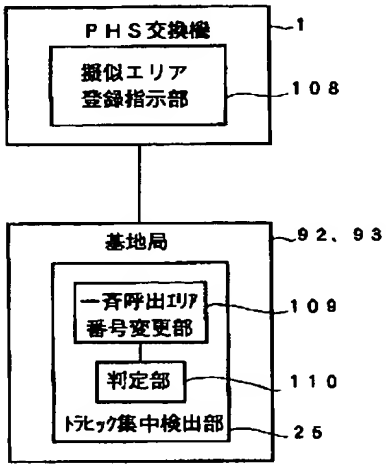
【図６】

第２のトラヒック集中検出構成図



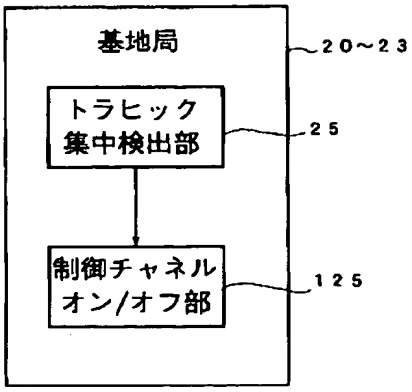
【図１０】

第３のトラヒック集中検出構成図



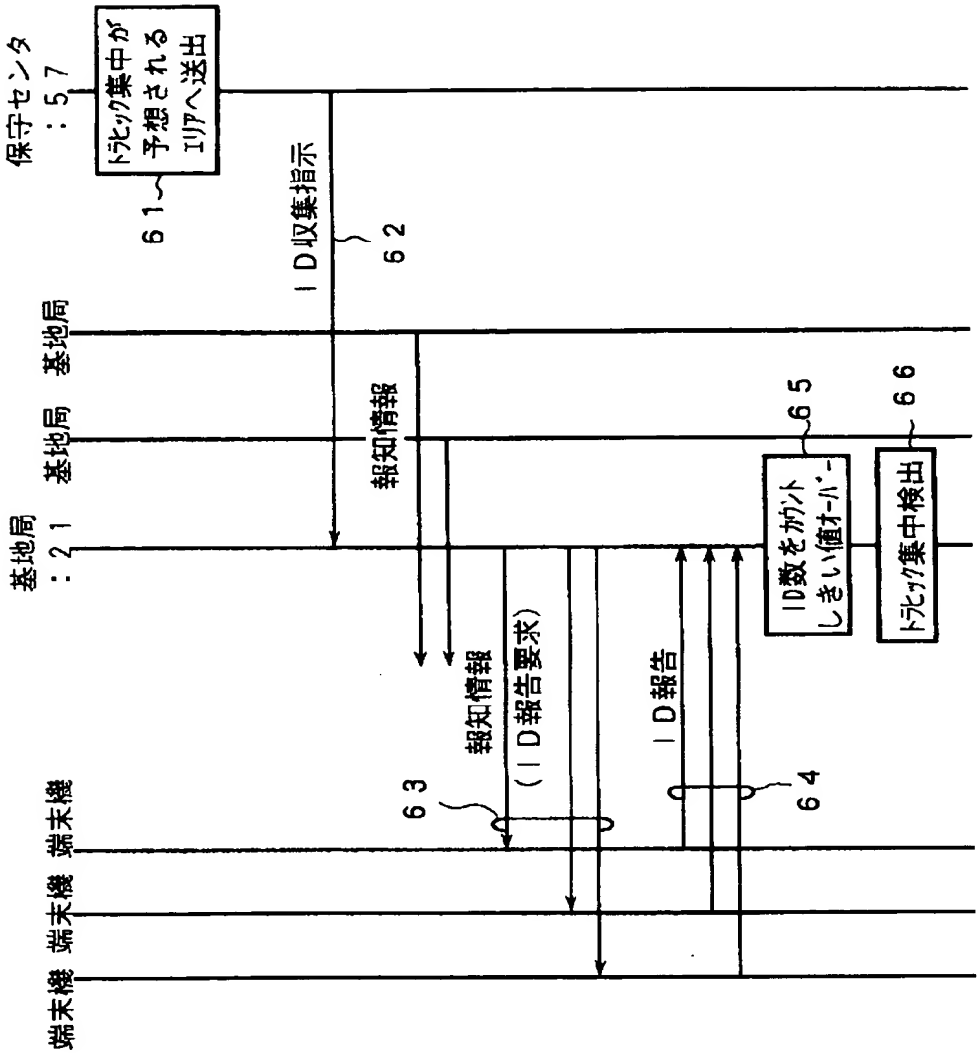
【図１４】

第３実施形態図



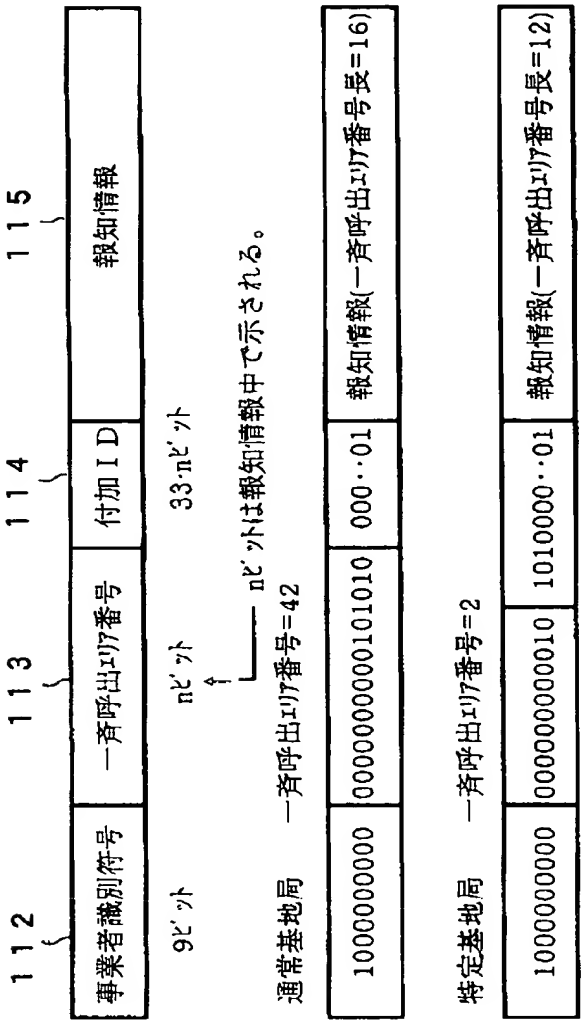
【図７】

第２のトラヒック集中検出動作説明シーケンス図



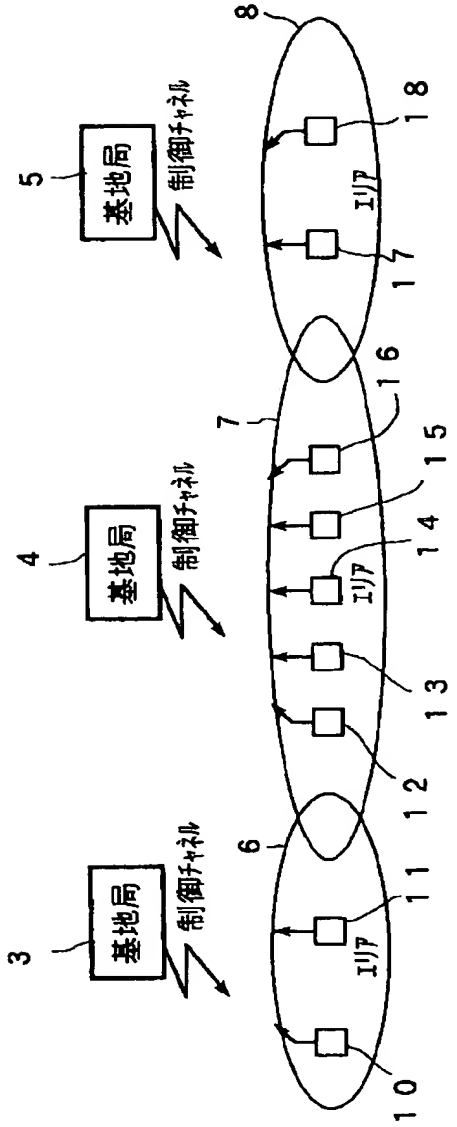
【図11】

一斉呼出エリア番号変更処理説明図



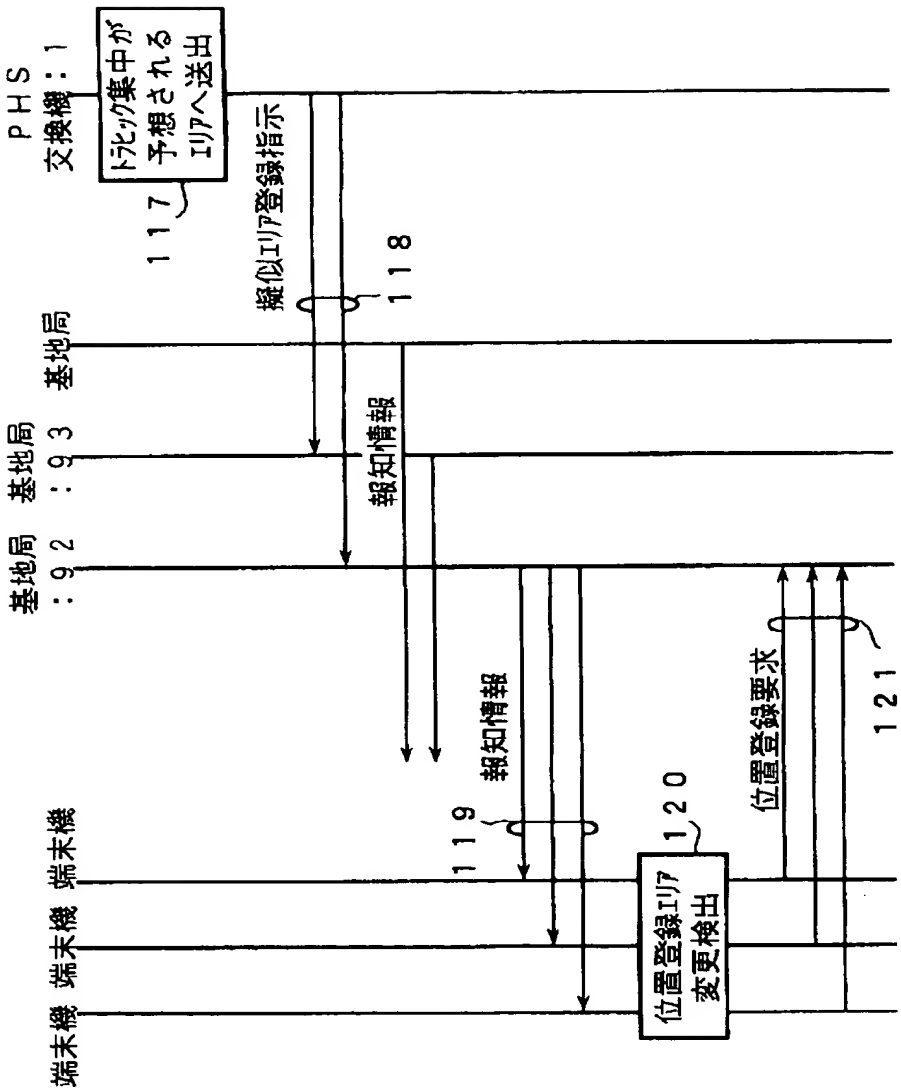
【図17】

従来問題点説明図



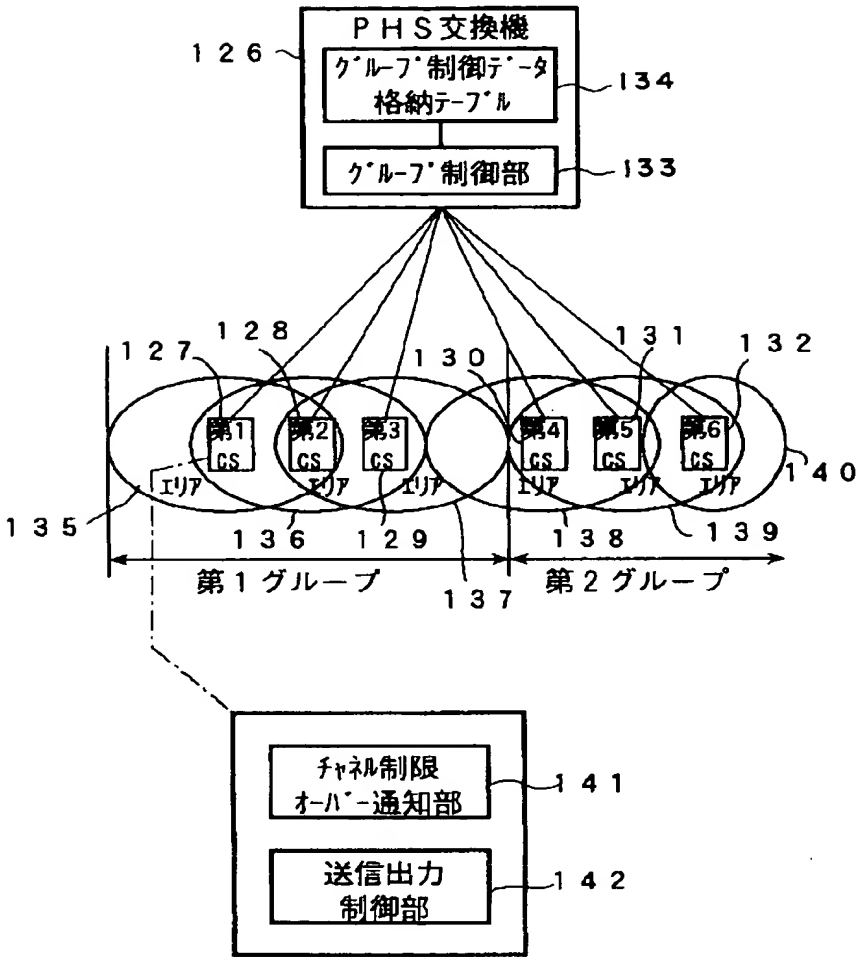
【図１２】

第３のトラヒック検出動作説明シーケンス図



【図１５】

第４実施形態図


ＰＨＳ交換機
１２６
ｸﾞﾙｰﾌﾟ制御ﾃﾞｰﾀ
格納ﾃｰﾌﾞﾙ
１３４
ｸﾞﾙｰﾌﾟ制御部
１３３
１２７
１２８
１３０
１３１
１３２
第1 CS
第2 CS
第3 CS
第4 CS
第5 CS
第6 CS
エリア
１４０
１３５
１３６
１２９
１３８
１３９
第１グループ
１３７
第２グループ
チャネル制限
オーバー通知部
１４１
送信出力
制御部
１４２